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Environmental Hazard Rankings of Pollutants Generated in Coal Gasification Processes

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Research Triangle Park, NC

Prepared for

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16. ABSTRACT The report gives results of an evaluation and ranking of environmental hazards associated with coal gasification. Applied chemical analytical data were provided by (1) research with an experimental gasifier, and (2) sampling of four commercial gasification processes. Gas, liquid, tar, and solid streams were quantitatively analyzed for almost 300 substances. Levels of production, stream concentrations, and estimated hazard potential of individual substances are included. Hazard potential was measured. A worst-case approach was taken in this summary, with maximum stream concentrations emphasized for all processes. These processes represent packed-bed, low- to medium-Btu gasifiers, which are known to produce significant contaminant loadings relative to other gasifiers. Coals tested ranged from lignite to anthracite. Approximately 50 representative pollutants were emphasized and ranked according to relative environmental hazard potential. Relative hazard potentials by stream type and process were also estimated.

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Toxicity	Hazards	06T
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ENVIRONMENTAL HAZARD RANKINGS OF POLLUTANTS GENERATED IN COAL GASIFICATION PROCESSES

by

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ABSTRACT

The purpose of this report is to evaluate and rank environmental hazards associated with synthetic fuels production. The compilations presented are based on information provided by Radian Corporation as well as research conducted at Research Triangle Institute. Radian Corporation provided chemical analyses of specific products, by-products, process streams, and effluents obtained during source tests at four operating coal gasifiers. These gasifiers were the Lurgi gasifier located at Kosovc, Yugoslavia; two Wellman-Galusha gasifiers located at York, Pennsylvania and Ft. Snelling, Minnesota, and a Chapman gasifier located in Kingsport, Tennessee.

Data obtained from the laboratory coal gasifier unit at R.T.I. was also subjected to analysis. Product gas, gasifier condensate, by-product tar, and ash residue analyses from ten individual gasification tests were used. These tests involved Pennsylvania Bottom Red Ash anthracite, Illinois #6 and W. Kentucky #9 bituminous coals, Montana Rosebud/McKay and Wyoming Smith/Roland subbituminous coals, and N. Dakota Beulah/Zap lignite.

This report contains tabulated chemical analysis results for individual product, by-product, process, and waste streams generated in coal gasification processes. In addition, chemical species have been ranked in order of potential hazard by stream medium for each process. These results have been used in preparation of a separate summary document.

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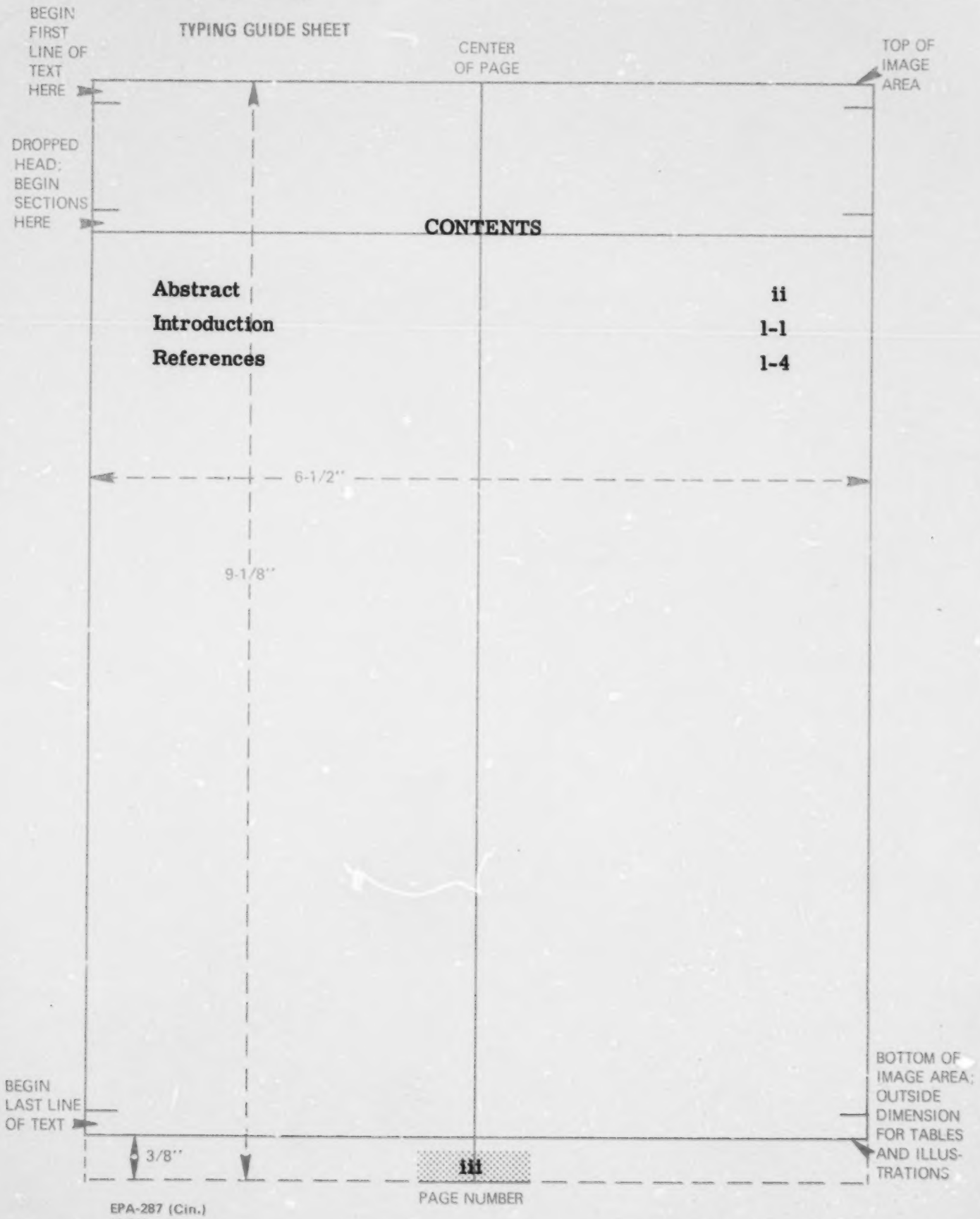

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INTRODUCTION

The U.S. Environmental Protection Agency is engaged in a continuing program of environmental assessment and pollution control activities relative to the production of synthetic fuels from coal. This report contains data and calculations resulting from environmental measurements made by the Radian Corporation and the Research Triangle Institute.

The Radian Corporation has provided chemical analytical data from source tests at four operating coal gasification plants. Selected product, byproduct, process, and waste streams were sampled and analyzed. Two facilities containing Wellman-Galusha gasifiers were tested; one uses anthracite coal at York, Pennsylvania and the other, located at Ft. Snelling, Minnesota, uses North Dakota Indian Head Lignite. Two other facilities were also studied: a facility involving Chapman gasifiers at Kingsport, Tennessee uses Virginia bituminous coal; and, a gasification plant at Kosovo, Yugoslavia uses a lignite for Lurgi gasifiers. The sampling effort encompassed solid, liquid, gaseous, and tar streams and the analytical effort included both organic and inorganic species. The sampling and chemical analysis methods and a description of the different gasification systems have been reported elsewhere.[1,2,3]

A laboratory scale gasifier has been constructed and operated at Research Triangle Institute for the purpose of studying pollutant formation and control. To date, approximately seventy gasification tests have been conducted with a wide range of fuels. For this study, ten gasification tests were selected for which extensive chemical analyses of product, byproduct, and waste streams are available. These tests were conducted with six different fuels ranging from lignite to anthracite. Specifically, North Dakota Beulah/Zap lignite, Wyoming Smith/Roland and Montana Rosebud/McKay subbituminous coals, Western Kentucky #9 and Illinois #6 bituminous coals, and Pennsylvania Bottom Red Ash anthracite were used. Details of sampling and analysis and a description of the gasifier are given elsewhere.[4,5,6]

The tables which follow show the application of an environmental assessment methodology based on established Multi-media Environmental Goals (MEGs).[7,8,9,10] The analysis described in this report has been

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restricted to health based discharge MEGs, i.e. DMEG(H). The first section of the report contains a list of the values used for the chemical species identified in the selected gasifier streams. They are listed by MEG subcategory. In some cases chemical analyses were reported generically (e.g. C_3, C_4, etc); listings are included in the table as reported for these cases. Where generic classifications span subcategories they have been included in the subcategory where the largest proportion of the classification is likely to occur. Where chemical species were identified for which no DMEG(H) are established, DMEG(H) values were generally adopted corresponding to the worst (lowest number) compound within the subcategory of the substance in question. An exception to this method of DMEG(H) assignment was made in the case of alkylated organics. Compounds of this type for which no formal DMEG(H) are available were assigned DMEG(H) values corresponding to those of the parent compound. Any other exceptions in assigning such "supplemental" DMEG(H) for chemical species for which no published values are available are noted in the table.

Each source or individual RTI test has been reported in a separate section. A summary table for each section gives basic process information such as coal type, feed rate and product flow rate, and heating value. A list of those streams tested follows with flow rates, total discharge severities, and total weighted discharge severities. The total weighted discharge severities have been normalized by process input and output. Additionally, a count of identified species and the number of those species present at concentrations exceeding their DMEG(H) is given. The compilations on these summary tables include calculations based on supplemental DMEG(H).

For each stream listed in the summary tables a separate compilation is included. An initial heading page gives the stream description and process information. Following the heading page, all of the chemical species identified within the stream are listed by MEG subcategory. The concentration, discharge severity, weighted discharge severity, and production factors based on coal input rate and energy output rate are given for each entry. Discharge severities based on supplemental DMEG(H) are given in parentheses. The last page of each list includes stream

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totals for discharge severity and weighted normalized and unnormalized discharge severities. These totals are listed both inclusive and exclusive of calculations involving supplemental DMEG(H).

Two additional tables are included for each stream which list those species found at discharge severity levels greater than one. The table entries are ranked first by the order of magnitude of the discharge severity and then by the weighted discharge severity which has been normalized using the coal input rate.

Finally, summary tables are provided for solid, liquid, gaseous, and tar media where species are ranked in order of descending product normalized weighted discharge severity based on the maximum weighted discharge severity for a species found in any stream of a particular medium.

The environmental assessment calculations presented in this report form the basis for a summary document,[11] "Environmental Hazard Rankings of Pollutants Generated in Coal Gasification Processes," outlining priorities for monitoring and pollution control at coal gasification plants. The summary document presents composite tables and conclusions drawn from an overall analysis of the source specific environmental assessment analyses contained in this document. Further, it contains ecological considerations, control technology recommendations, multimedia pollutant production factors, and relevant conclusions from the overall study of the available data.

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TABLE 2-1. DMEG* VALUES FOR SELECTED CHEMICAL COMPOUNDS

MEG Category	Chemical Name	Chemical Formula	Molecular Weight	DMEG (health) Air ($\mu g/m^3$)	Water ($\mu g/\ell$)	Land ($\mu g/g$)	Notes
01A	methane	CH_4	16	3.3E6	4.9E7	-	
01A	ethane	C_2H_6	28	6.1E6	9.2E7	-	
01A	propane	C_3H_8	44	9.0E6	1.4E8	-	
01A	butanes	C_4H_{10}	58	1.4E6	2.1E7	-	
01A	octane	C_8H_{18}	114	3.5E5	5.3E6	1.1E6	
01A	alkanes $>C_6$	C_xH_{2x+2}	--	3.5E5	5.3E6	1.1E6	W.C.; Octanes values
01A	methylcyclohexane	C_7H_{14}	98	3.5E5	5.3E6	1.1E6	Cyclohexane values
01A	alkanes $\geq C_{13}$	C_xH_{2x+2}	--	1.0E6	1.6E7	3.1E6	n-Dodecane values
01A	C_3	--	--	9.0E6	1.4E8	-	Propane values
01A	C_4	--	--	1.4E6	2.1E7	-	Butane values
01A	C_5	--	--	3.5E5	5.3E6	1.1E6	Pentanes values
01A	C_6	--	--	3.5E5	5.3E6	1.1E6	Hexanes values
01A	C_{6+}	--	--	6.1E5	9.6E6	1.9E6	Average values of hexanes, heptanes, octanes, nonanes, and alkanes (10,11)
01B	ethylene	C_2H_4	28	5.7E6	8.6E7	-	
01B	propylene	C_3H_6	42	8.6E6	1.3E7	-	
01C	acetylene	C_2H_2	26	2.7E6	4.1E7	-	
01C	phenylacetylene	C_6H_5CCH	102	2.7E6	4.1E7	-	Acetylene values
03A	anisoles	C_7H_8O	108	1.62E5	2.43E6	4.86E5	W.C.; 2-Methoxybiophenyl values
03A	methylanisole	$C_7H_7OCH_3$	122	1.62E5	2.43E6	4.86E5	W.C.; 2-Methoxybiophenyl values
05A	aliphatic alcohols $>C_6$	$C_xH_{(2x+1)}OH$	--	3.6E5	5.4E6	1.1E6	Pentanols values

*DMEG = Discharge Multimedia Environmental Goal, based upon health effects.
W.C. = Worst case in MEG subcategory

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MEG Category	Chemical Name	Chemical Formula	Molecular Weight	DMEG (health) Air ($\mu g/m^3$)	Water ($\mu g/\ell$)	Land ($\mu g/g$)	Notes
05A	aliphatic alcohols $\geq C_{13}$	$C_xH_{(2x+1)}OH$	--	8.1E4	1.2E6	2.4E5	Phenethyl alcohols values
05B	alkylalcohols $>C_6$	$C_xH_{(2x+1)}OH$	--	1.6E5	2.4E6	4.8E5	2,6-Dimethyl-4-heptanol values
05B	alkylalcohols $>C_{13}$	$C_xH_{2x+1}OH$	--	1.6E5	2.4E6	4.8E5	2,6-Dimethyl-4-heptanol values
07B	ketones	--	--	1.2E4	1.8E5	3.6E4	camphor values
07B	acetophenone	$C_6H_5C_2H_3O_2$	120	4.05E4	6.08E5	1.2E5	
08A	formate	$COOH^-$	45	9.0E3	1.4E5	2.8E4	formic acid values
08A	organic acids	--	--	1.04E3	1.55E4	3.1E3	W.C.; saturated long chain acids
08A	phthalic acids	$C_8H_6O_4$	166	2.07E5	3.1E6	6.2E5	
08A	phthalic esters	--	--	2.07E5	3.1E6	6.2E5	Phthalic acids values
08D	adipate esters	--	--	7.2E4	1.08E6	2.16E5	W.C. (08D200-260); Diethyl adipate values
08D	phthalate esters	--	--	5.0E3	7.5E4	1.5E4	
08D	$>C_9$ aliphatic esters	--	--	5.0E3	7.5E4	1.5E4	W.C.; phthalate esters values
09B	cyanotoluene (Benzonitrile)	C_6H_5CN	103	3.2E4	4.9E5	9.8E4	
10C	aniline	$C_6H_5NH_2$	93	1.9E4	2.9E5	5.7E4	
10C	C_2-alkylaniline	$C_8H_{10}NH_2$	121	1.9E4	2.9E5	5.7E4	Aniline values
10C	C_3-alkylaniline	$C_9H_{12}NH_2$	135	1.9E4	2.9E5	5.7E4	Aniline values
10C	aminotoluene	$C_7H_7NH_2$	107	1.1E2	1.65E3	3.30E2	
10C	benzofluoreneamine	$C_{17}H_{11}HN_2$	231	1.0E2	1.5E3	3.0E2	W.C., 1,4-Diaminobenzene values
10C	methylaminoacenaphthylene	$C_{13}H_{13}N$	183	1.0E2	1.5E3	3.0E2	W.C.; 1,4-Diaminobenzene values

*DMEG = Discharge Multimedia Environmental Goal, based upon health effects.
W.C. = Worst case in MEG subcategory

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TABLE 2-1 DMEG* VALUES FOR SELECTED CHEMICAL COMPOUNDS

MEG Category	Chemical Name	Chemical Formula	Molecular Weight	DMEG (health) Air ($\mu g/m^3$)	Water ($\mu g/\ell$)	Land ($\mu g/g$)	Notes
10C	methybenzofluorene-amine	$C_{18}H_{13}NH_2$	245	1.0E2	1.5E3	3.0E2	W.C.; 1,4-Diaminobenzene values
10C	benzidine	$C_{12}H_{12}N_2$	184	1.0E3	1.5E4	2.0E3	
10C	1-aminonapthalene	$C_{10}H_9N$	143	5.64E2	8.5E3	1.7E3	
10C	methylaminonaph-thalene	$C_{11}H_{11}N$	157	5.64E2	8.5E3	1.7E3	1-Aminonaphthalene values
10C	aminotetralin	$C_{10}H_{13}N$	147	1.65E2	2.5E3	5.0E2	W.C.(10C200-220); 2-aminonaphthalene values
13A	methanethiol	CH_3SH	48.1	1.0E3	1.5E4	-	
13A	ethanethiol	C_2H_5SH	62.1	1.0E3	1.5E4	3.0E3	
13A	propylenethiol	C_3H_5SH	74.1	8.06E4	1.21E6	2.42E5	
15A	benzene	C_6H_6	78	3.0E3	1.5E3	3.0E2	
15A	C_2-alkylbenzene	C_8H_{10}	108	3.0E3	1.5E3	3.0E2	benzene values
15A	C_3-alkylbenzene	C_9H_{12}	120	3.0E3	1.5E3	3.0E2	benzene values
15A	toluene	C_7H_8	92	3.7E5	8.7E4	1.7E3	
15A	ethylbenzene	C_8H_{10}	106	4.35E5	6.5E6	1.3E6	
15A	styrene	C_8H_8	104	4.2E5	6.3E6	1.26E6	
15A	n-propylbenzene	$C_{10}H_{14}$	134	2.5E5	3.7E6	7.5E5	
15A	C_3-benzene	C_9H_{12}	120	2.5E5	3.7E6	7.5E5	n-propylbenzene values
15A	C_4-benzene	$C_{10}H_{14}$	134	2.5E5	3.7E6	7.5E5	n-propylbenzene values
15A	biphenyl	$C_{12}H_{10}$	130	1.0E3	1.5E4	3.0E3	
15A	biphenylene	$C_{12}H_8$	104	1.0E3	1.5E4	3.0E3	biphenyl values
15A	diphenylmethane	$C_{13}H_{12}$	168	1.0E3	1.5E4	3.0E3	biphenyl values
15B	indan	C_9H_{10}	118	2.25E5	3.4E6	6.8E5	

*DMEG = Discharge Multimedia Environmental Goal, based upon health effects.

W.C. = Worst case in MEG subcategory

TABLE 2-1 DMEG* VALUES FOR SELECTED CHEMICAL COMPOUNDS

MEG Category	Chemical Name	Chemical Formula	Molecular Weight	DMEG (health) Air ($\mu g/m^3$)	Water ($\mu g/\ell$)	Land ($\mu g/g$)	Notes
15B	C_2-alkylindane	$C_{11}H_{14}$	146	2.25E5	3.4E6	6.8E5	Indan values
15B	C_3-alkylindane	$C_{12}H_{16}$	160	2.25E5	3.4E6	6.8E5	Indan values
15B	methylindane	$C_{10}H_{12}$	132	2.25E5	3.4E6	6.8E5	Indan values
15B	xylenes	C_8H_{10}	106	4.35E5	6.5E6	1.3E6	
15B	o-xylene	C_8H_{10}	106	4.35E5	6.5E6	1.3E6	xylenes values
15B	m- and p- xylene	C_8H_{10}	106	4.35E5	6.5E6	1.3E6	xylenes values
15B/A	xylene and ethyl benzene	C_8H_{10}	106	4.35E5	6.5E6	1.3E6	have identical MATE values
15B	other aromatics	--	--	4.35E5	6.5E6	1.3E6	xylenes values
15B	tetrahydronaphthalene	$C_{10}H_{12}$	132	1.3E5	2.0E6	4.0E5	
16A	polychlorinated biphenyls (PCB)	$C_{12}Cl_n$	--	1.0E0	5.0E-3	1.0E-3	
17A	dinitrotoluenes	$C_7H_6N_2O_4$	182	1.5E3	2.25E4	4.5E3	
18A	phenol	C_6H_5OH	94	1.9E4	1.7E4	3.4E3	
18A	C_3 phenol	$C_9H_{11}OH$	136	1.9E4	5.0E0	1.0E0	ethylphenol values
18A	C_4 phenol	$C_{10}H_{13}OH$	150	1.9E4	5.0E0	1.0E0	ethylphenol values
18A	C_2-alkylphenol	C_8H_9OH	122	1.9E4	5.0E0	1.0E0	ethylphenol values
18A	C_3-alkylphenol	$C_9H_{11}OH$	136	1.9E4	5.0E0	1.0E0	ethylphenol values
18A	C_4-alkylphenol	$C_{10}H_{13}OH$	150	1.9E4	5.0E0	1.0E0	ethylphenol values
18A	isopropylphenol	$C_9H_{11}OH$	136	1.9E4	5.0E0	1.0E0	ethylphenol values
18A	n-propylphenol	$C_9H_{11}OH$	136	1.9E4	5.0E0	1.0E0	ethylphenol values

*DMEG = Discharge Multimedia Environmental Goal, based upon health effects.

W.C. = Worst case in MEG subcategory

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TABLE 2-1. DMEG* VALUES FOR SELECTED CHEMICAL COMPOUNDS

MEG Category	Chemical Name	Chemical Formula	Molecular Weight	DMEG (health) Air ($\mu g/m^3$)	Water ($\mu g/\ell$)	Land ($\mu g/g$)	Notes
18A	cresol	C_7H_7OH	108	1.0E4	5.0E0	1.0E0	
18A	m & p-cresol	C_7H_7OH	108	1.0E4	5.0E0	1.0E0	cresol values
18A	o-cresol	C_7H_7OH	108	1.0E4	5.0E0	1.0E0	cresol values
18A	cresols/xylenols	--	--	1.0E4	5.0E0	1.0E0	cresol values
18A	methylcresol	C_8H_9OH	122	1.0E4	5.0E0	1.0E0	cresol values
18A	ethylphenols	$C_8H_{13}OH$	126	1.0E4	5.0E0	1.0E0	
18A	methyl n-propyl-phenol	$C_{10}H_{17}OH$	154	1.0E4	5.0E0	1.0E0	ethylphenols values
18A	sec-butylphenol	$C_{10}H_{17}OH$	154	1.0E4	5.0E0	1.0E0	ethylphenols values
18A	phenyl phenol	$C_6H_5C_6H_4OH$	170	2.25E4	5.0E0	1.0E0	
18A	methylene diphenol	$C_{13}H_{12}$	168	3.5E4	5.0E0	1.0E0	2.2-dihydroxydiphenyl values
18A	xylenol	$C_8H_{10}OH$	123	1.3E4	5.0E0	1.0E0	
18A	methylethyl phenol	$C_9H_{12}OH$	137	2.4E4	5.0E0	1.0E0	ethylcresols values
18A	2,4,6-trimethyl phenol	$C_9H_{10}OH$	135	5.9E4	5.0E0	1.0E0	
18C	1-naphthol	$C_{10}H_{10}OH$	147	1.17E5	5.0E0	1.0E0	
18C	1-acenaphthol	$C_{12}H_9OH$	170	1.09E5	5.0E0	1.0E0	W.C.; 2-naphthol values
18C	C_2-alkylacenaphthol	$C_{14}H_{13}OH$	198	1.09E5	5.0E0	1.0E0	W.C.; 2-naphthol values
18C	C_3-alkylacenaphthol	$C_{15}H_{15}OH$	212	1.09E5	5.0E0	1.0E0	W.C.; 2-naphthol values
18C	C_2-alkylhydroxy-acenaphthene	$C_{16}H_{13}OH$	222	1.09E5	5.0E0	1.0E0	W.C.; 2-naphthol values
18C	C_3-alkylhydroxy-acenaphthene	$C_{17}H_{15}OH$	236	1.09E5	5.0E0	1.0E0	W.C.; 2-naphthol values

*DMEG = Discharge Multimedia Environmental Goal, based upon health effects.

W.C. = Worst case in MEG subcategory

TABLE 2-1 DMEG* VALUES FOR SELECTED CHEMICAL COMPOUNDS

MEG Category	Chemical Name	Chemical Formula	Molecular Weight	DMEG (health) Air (µg/m³)	Water (µg/ℓ)	Land (µg/g)	Notes
18C	C_5-alkylhydroxy-anthracene	$C_{19}H_{19}OH$	264	1.0E5	5.0E0	1.0E0	W.C.; 2-naphthol values
18C	C_2-alkyhydroxy-pyrene	$C_{18}H_{13}OH$	246	1.09E5	5.0E0	1.0E0	W.C.; 2-naphthol values
18C	C_2-alkylnaphthol	$C_{12}H_{14}OH$	175	1.09E5	5.0E0	1.0E0	W.C.; 2-naphthol values
18C	hydroxyacenaphthene	$C_{14}H_9OH$	194	1.09E5	5.0E0	1.0E0	W.C.; 2-naphthol values
18C	hydroxyacenaphthy-lene	$C_{12}H_7OH$	168	1.09E5	5.0E0	1.0E0	W.C.; 2-naphthol values
18C	hydroxyanthracene	$C_{14}H_9OH$	194	1.09E5	5.0E0	1.0E0	W.C.; 2-naphthol values
18C	hydroxybenzofluo-rene	$C_{17}H_{11}OH$	232	1.09E5	5.0E0	1.0E0	W.C.; 2-naththol values
18C	methylacenaphthol	$C_{13}H_{11}OH$	194	1.09E5	5.0E0	1.0E0	W.C.; 2-naphthol values
18C	methylnaphthol	$C_{11}H_{10}OH$	159	1.09E5	5.0E0	1.0E0	W.C.; 2-naphthol values
18C	indanol	C_9H_9OH	134	1.5E5	5.0E0	1.0E0	
20B	dinitrocresol	$C_7H_6N_2O_5$	198	2.0E2	5.0E0	1.0E0	
21A	naphthalene	$C_{10}H_8$	128.2	5.0E4	7.5E5	1.5E5	
21A	higher aromatics	--	--	5.0E4	7.5E5	1.5E5	naphthalene values
21A	n-propylnaphthalene	$C_{13}H_{14}$	170	5.0E4	7.5E5	1.5E5	naphthalene values
21A	methylnaphthalene	$C_{11}H_{10}$	142	2.25E5	3.38E6	6.76E5	mono alkyl naphthalenes values
21A	1-methylnaphthalene	$C_{11}H_{10}$	142	2.25E5	3.38E6	6.76E5	
21A	2-methylnaphthalene	$C_{11}H_{10}$	142	2.25E5	3.38E6	6.76E5	
21A	C_2alkylnaphthalene	$C_{12}H_{12}$	156	2.25E5	3.38E6	6.76E5	mono alkyl naphthalenes values
21A	anthracene	$C_{14}H_{10}$	178	5.6E4	8.4E5	1.7E5	

*DMEG = Discharge Multimedia Environmental Goal, based upon health effects.
W.C. = Worst case in MEG subcategory

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TABLE 2-1. DMEG* VALUES FOR SELECTED CHEMICAL COMPOUNDS

MEG Category	Chemical Name	Chemical Formula	Molecular Weight	DMEG (health) Air ($\mu g/m^3$)	Water ($\mu g/\ell$)	Land ($\mu g/g$)	Notes
21A	C_2-alkylanthracene	$C_{16}H_{14}$	206	5.6E4	8.4E5	1.7E5	anthracene values
21A	methyl anthracene	$C_{15}H_{12}$	192	5.6E4	8.4E5	1.7E5	anthracene values
21A	phenanthrene	$C_{14}H_{10}$	178	1.6E3	2.4E4	4.8E3	
21A	acenaphthene	$C_{12}H_{10}$	154	1.6E3	2.4E4	4.8E3	W.C.; phenanthrene values
21A	acenaphthylene	$C_{12}H_8$	152	1.6E3	2.4E4	4.8E3	W.C.; phenanthrene values
21A	C_2-Alkylacenaphthalene	$C_{14}H_{12}$	180	1.6E3	2.4E4	4.8E3	W.C.; phenanthrene values
21A	C_2-alkylacenaphthene	$C_{14}H_{14}$	182	1.6E3	2.4E4	4.8E3	W.C.; phenanthrene values
21A	C_3-alkylacenaphthene	$C_{15}H_{16}$	196	1.6E3	2.4E4	4.8E3	W.C.; phenanthrene values
21A	binaphthyl	$C_{20}H_{18}$	258	1.6E3	2.4E4	4.8E3	W.C.; phenanthrene values
21A	methylacenaphthylene	$C_{13}H_{10}$	166	1.6E3	2.4E4	4.8E3	W.C.; phenanthrene values
21A	methylacenaphthene	$C_{13}H_{12}$	168	1.6E3	2.4E4	4.8E3	W.C.; phenanthrene values
21A	$C_{15}H_{12}$:3 rings	$C_{15}H_{12}$	192	1.6E3	2.4E4	4.8E3	W.C.; phenanthrene values
21B	benzo(a)anthracene	$C_{18}H_{12}$	228	4.5E1	6.7E2	1.34E2	
21B	7,12-dimethylbenzo(a)anthracene	$C_{20}H_{16}$	256	2.6E-1	3.9E0	7.8E-1	
21B	methyl phenanthracene	$C_{21}H_{20}$	272	2.6E-1	3.9E0	7.8E-1	W.C.; 7,12-dimethylbenzo(a)anthracene values
21B	methyltriphenylene	$C_{19}H_{14}$	242	2.6E-1	3.9E0	7.8E-1	W.C.; 7,12-dimethylbenzo(a)anthracene values
21B	triphenylene	$C_{18}H_{12}$	228	2.6E-1	3.9E0	7.8E-1	W.C.; 7,12-dimethylbenzo(a)anthracene values

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W.C. = Worst case in MEG subcategory

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TABLE 2-1. DMEG* VALUES FOR SELECTED CHEMICAL COMPOUNDS

MEG Category	Chemical Name	Chemical Formula	Molecular Weight	DMEG (health) Air ($\mu g/m^3$)	Water ($\mu g/\ell$)	Land ($\mu g/g$)	Notes
21B	$C_{16}H_{10}$:4 rings	$C_{16}H_{10}$	202	2.6E-1	3.9E0	7.8E-1	W.C.; 7,12-dimethylbenzo(a)anthracene values
21B	3-methylcholanthrene	$C_{21}H_{16}$	268	3.8E0	5.6E1	1.1E1	
21B	benzo(c)phenanthrene	$C_{18}H_{12}$	228	2.24E2	3.36E2	6.73E2	
21B	chrysene	$C_{18}H_{12}$	228	2.22E3	3.33E4	6.6E3	
21B	methyl chrysene	$C_{19}H_4$	242	1.8E3	2.7E4	5.4E3	
21B	pyrene	$C_{16}H_{10}$	202	2.3E5	3.45E6	6.9E5	
21B	1-methyl pyrene	$C_{17}H_{12}$	216	2.3E5	3.45E6	6.9E5	pyrene values
21C	dibenz(a,h) anthracene	$C_{22}H_{14}$	278	9.3E-2	1.4E0	2.8E-1	
21C	benzo(a)pyrene	$C_{20}H_{12}$	252	2.0E-2	3.0E-1	6.0E-2	
21C	benzo pyrene	$C_{20}H_{12}$	252	2.0E-2	3.0E-1	6.0E-2	benzo(a)pyrene values
21C	perylene	$C_{20}H_{12}$	252	2.0E-2	3.0E-1	6.0E-2	W.C.; benzo(a)pyrene values
21C	benzo(e)pyrene	$C_{20}H_{12}$	252	3.0E3	4.6E4	9.1E3	
21D	benzoperylene	$C_{22}H_{12}$	276	4.34E1	6.51E2	1.30E2	W.C.; dibenzo(a,l)pyrene values
21D	benzo(g,h,i) perylene	$C_{22}H_{12}$	276	4.34E1	6.51E2	1.30E2	W.C.; dibenzo(a,l)pyrene values
22A	indene	C_9H_8	116	4.5E4	6.75E5	1.4E5	
22A	C_2-alkylindene	$C_{11}H_{12}$	144	4.5E4	6.75E5	1.4E5	Indene values
22A	C_3-alkylindene	$C_{12}H_{14}$	158	4.5E4	6.75E5	1.4E5	Indene values
22A	fluorene	$C_{13}H_{10}$	166	4.5E4	6.75E5	1.4E5	Indene values
22A	methylindene	$C_{10}H_{10}$	130	4.5E4	6.75E5	1.4E5	Indene values

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TABLE 2-1. DMEG* VALUES FOR SELECTED CHEMICAL COMPOUNDS

MEG Category	Chemical Name	Chemical Formula	Molecular Weight	DMEG (health) Air ($\mu g/m^3$)	Water ($\mu g/\ell$)	Land ($\mu g/g$)	Notes
22A	methylfluorene	$C_{14}H_{12}$	180	4.5E4	6.75E5	1.4E5	Indene values
22B	benzofluorene (fluoranthene)	$C_{16}H_{10}$	202	9.0E4	1.4E6	2.8E5	
22B	benzo(b)fluorene	$C_{17}H_{12}$	216	9.0E4	1.4E6	2.8E5	
22B	benzo(a)fluorene	$C_{17}H_{12}$	216	9.0E4	1.4E6	2.8E5	
22C	benzo(k)fluoranthene	$C_{20}H_{12}$	252	1.6E3	2.4E4	4.9E3	
22C	benzo(b)fluoranthene	$C_{20}H_{12}$	252	1.6E3	2.4E4	4.9E3	
22D	indeno(1,2,3-cd) pyrene	$C_{22}H_{12}$	276	1.63E3	2.4E4	4.8E3	
23A	pyridine	C_5H_5N	79	1.5E4	2.3E5	4.5E4	
23A	C_2-alkylpyridine	C_7H_9N	107	1.5E4	2.3E5	4.5E4	pyridine values
23A	C_3-alkylpyridine	$C_8H_{11}N$	121	1.5E4	2.3E5	4.5E4	pyridine values
23A	C_4-alkylpyridine	$C_9H_{13}N$	135	1.5E4	2.3E5	4.5E4	pyridine values
23A	methylpyridine (picolines)	C_6H_7N	93	3.6E4	5.3E5	1.1E5	
23B	quinolines	C_9H_7N	129	1.6E4	2.4E5	4.7E4	
23B	C_2-alkylquinolines	$C_{11}H_{11}N$	157	1.6E4	2.4E5	4.7E4	
23B	C_3-alkylquinolines	$C_{12}H_{13}N$	171	1.6E4	2.4E5	4.7E4	
23B	2-methylquinoline	$C_{10}H_9N$	143	5.5E4	8.3E5	1.7E5	
23B	acridine	$C_{13}H_9N$	179	9.0E4	1.4E6	2.7E5	
23B	C_3-alkylacridine	$C_{16}H_{15}N$	221	9.0E4	1.4E6	2.7E5	acridine values
23B	C_2-alkylacridine	$C_{15}H_{13}N$	207	9.0E4	1.4E6	2.7E5	acridine values
23B	C_2-alkylbenzo-quinoline	$C_{15}H_{14}N$	208	9.0E4	1.4E6	2.7E5	acridine values

*DMEG = Discharge Multimedia Environmental Goal, based upon health effects.
W.C. = Worst case in MEG subcategory

TABLE 2-1 DMEG* VALUES FOR SELECTED CHEMICAL COMPOUNDS

MEG Category	Chemical Name	Chemical Formula	Molecular Weight	DMEG (health) Air ($\mu g/m^3$)	Water ($\mu g/\ell$)	Land ($\mu g/g$)	Notes
23B	C_3-alkylbenzo quinoline	$C_{16}H_{16}N$	222	9.0E4	1.4E6	2.7E5	acridine values
23B	methylacridine	$C_{14}H_{11}N$	193	9.0E4	1.4E6	2.7E5	acridine values
23B	dihydroacridine	$C_{13}H_{11}N$	181	1.6E2	2.5E3	4.9E2	
23B	methylbenzophen-anthridine	$C_{18}H_{15}N$	245	1.6E2	2.5E3	4.9E2	W.C.; dihydroacridine values
23B	benzophenanthridine	$C_{17}H_{13}N$	231	9.0E4	1.4E6	2.7E5	phenanthridine values
23B	benzoquinoline (phenanthridine)	$C_{13}H_9N$	179	9.0E4	1.4E6	2.7E5	
23B	methylbenzo-quinoline	$C_{14}H_{11}N$	193	9.0E4	1.4E6	2.7E5	benzo(h)quinoline values
23C	indole	C_8H_7N	117	1.1E4	1.7E5	3.3E4	
23C	methylindole	C_9H_9N	131	4.5E4	6.8E5	1.4E5	
23C	carbazole	$C_{12}H_9N$	169	2.3E4	3.5E5	6.8E4	
23C	methylcarbazole	$C_{13}H_{11}N$	181	2.3E4	3.4E5	6.8E4	
23C	methylpyrroline	C_5H_8NH	83	1.0E2	1.5E3	3.0E2	W.C.; dibenzo(c,g)carbazole values
23C	pyrrolidine	C_4H_8NH	71	1.0E2	1.5E3	3.0E2	W.C.; dibenzo(c,g)carbazole values
24A	methyldioxolane	$C_4H_8O_2$	88	8.5E6	1.38E8	2.5E7	W.C.; furan values
25A	thiophene	C_4H_4S	84	4.5E3	6.75E4	1.35E5	
25A	C_2-thiophenes	C_6H_8S	112	4.5E3	6.75E4	1.35E5	thiophene values
25A	methylthiophene	C_5H_6S	98	2.25E4	3.4E5	7.0E4	
25B	benzothiophene	C_9H_8S	136	2.3E4	3.5E5	7.0E4	

*DMEG = Discharge Multimedia Environmental Goal, based upon health effects.

W.C. = Worst case in MEG subcategory

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TABLE 2-1. DMEG* VALUES FOR SELECTED CHEMICAL COMPOUNDS

MEG Category	Chemical Name	Chemical Formula	Molecular Weight	DMEG (health) Air ($\mu g/m^3$)	Water ($\mu g/\ell$)	Land ($\mu g/g$)	Notes
27	lithium	Li	69	2.2E1	3.30E2	7.0E1	
28	sodium	Na	23.0	5.3E4	1.0E5	2.0E4	
28	sodium oxide	Na_2O	62.0	5.3E4	1.0E5	2.0E4	Na^+ values
29	potassium	K	39.1	2.0E3	3.0E4	1.0E3	KOH land value
29	potassium oxide	K_2O	94.2	2.0E3	3.0E4	6.0E3	KOH values
30	rubidium	Rb^+	85.5	1.2E5	1.8E6	3.6E5	
31	cesium	Cs^+	132.9	8.2E4	1.2E6	2.5E5	
32	beryllium	Be	9.0	2.0E0	8.7E0	1.7E0	
33	magnesium	Mg	24.3	6.0E3	9.0E4	1.8E4	
33	magnesium oxide	MgO	40.3	1.0E4	1.5E5	3.0E4	
	rhenium	Re	186.2	6.0E3	9.0E4	1.8E4	Mg values
34	calcium	Ca^{++}	40.1	1.6E4	2.4E5	4.8E4	
34	calcium oxide	CaO	56.1	1.6E4	2.4E5	4.8E4	Ca^{++} values
35	strontium	Sr	87.6	3.0E3	4.5E4	9.2E3	
36	barium	Ba	137.3	5.0E2	5.0E3	1.0E3	
37	boron	B	10.8	3.1E3	4.7E4	9.3E3	
38	aluminum	Al	27.0	5.2E3	8.0E4	1.6E4	
38	aluminum oxide	Al_2O_3	102.0	1.0E4	1.5E5	3.0E4	
39	gallium	Ga	69.7	5.0E3	7.4E4	1.5E4	
41	thallium	Tl	204.4	1.0E2	1.5E3	3.0E2	

*DMEG = Discharge Multimedia Environmental Goal, based upon health effects.

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TABLE 2-1. DMEG* VALUES FOR SELECTED CHEMICAL COMPOUNDS

MEG Category	Chemical Name	Chemical Formula	Molecular Weight	DMEG (health) Air ($\mu g/m^3$)	Water ($\mu g/\ell$)	Land ($\mu g/g$)	Notes
42	carbon	C	12.0	3.5E3	5.3E4	1.6E4	
42	carbonate	$CO^{=}_3$	60.0	9.0E6	5.3E4	1.6E4	CO_2 air value C_n water & land values
42	carbon dioxide	CO_2	44.0	9.0E6	-	-	
42	carbon monoxide	CO	28.0	4.0E4	6.0E5	-	
43	silicon	Si	28.1	1.0E4	1.5E5	3.0E4	
43	silicon dioxide	SiO_2	60.1	1.0E4	1.5E5	3.0E4	
44	germanium	Ge	72.6	5.6E2	8.4E3	1.7E3	
45	tin	Sn	118.7	1.1E4	3.0E4	6.0E3	SnO value w/factor of $\frac{SnO}{Sn} = \frac{135}{119}$ air,
46	lead	Pb	207.2	1.5E2	2.5E2	5.0E1	
47	nitrogen	N_2	28.0	-	-	1.5E4	Nitric Acid land value
47	ammonia	NH_4	32.0	1.8E4	2.5E3	5.0E2	
47	cyanide	CN^-	26.0	5.0E3	1.0E3	2.0E2	
47	hydrogen cyanide	HCN	27.0	5.0E3	1.0E3	2.0E2	
47	nitrate	NO^-_3	62.0	9.0E3	1.4E5	1.5E4	Nitrogen oxides-air and water; Nitric acid-land
47	nitrite	NO^-_2	46.0	9.0E3	1.4E5	1.5E4	Nitrogen oxides-air and water; Nitric acid-land
47	nitrogen dioxide	NO_2	96.0	9.0E3	1.4E5	-	nitrogen oxides values
47	nitrogen oxide	NO	30.0	9.0E3	1.4E5	-	Nitrogen oxides values
48	phosphorus	P	31.0	1.0E2	1.5E4	3.0E3	
48	phosphate	PO^{-3}_4	95.0	1.0E2	1.5E4	3.0E3	PO^{-3}_3 values
49	arsenic	As	74.9	2.0E0	2.0E0	4.0E1	

*DMEG = Discharge Multimedia Environmental Goal, based upon health effects.

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TABLE 2-1. DMEG* VALUES FOR SELECTED CHEMICAL COMPOUNDS

MEG Category	Chemical Name	Chemical Formula	Molecular Weight	DMEG (health) Air ($\mu g/m^3$)	Water ($\mu g/\ell$)	Land ($\mu g/g$)	Notes
50	antimony	Sb	121.8	5.0E2	2.5E2	1.5E2	
51	bismuth	Bi	209.0	4.1E2	6.1E3	1.2E3	
53	sulfur	S	32.1	1.3E4	2.0E5	4.0E4	SO_2 values
53	carbon disulfide	CS_2	76.2	3.0E3	9.0E5	-	
53	carbonyl sulfide	COS	60.1	3.8E3	-	-	
53	hydrogen sulfide	H_2S	34.1	1.5E4	2.5E2	-	S = value for water
53	sulfate	SO_4^{-2}	96.1	1.0E3	1.3E6	2.6E5	H_2SO_4 value (worst 53)(air)
53	sulfide	S^{-2}	64.2	1.5E4	2.5E2	5.0E1	
53	sulfite	SO_3^{-2}	80.1	1.0E3	1.5E4	3.0E3	H_2SO_4 values (worst 53)
53	sulfur dioxide	SO_2	64.1	1.3E4	2.0E5	4.0E4	
53	sulfur trioxide	SO_3	80.1	1.2E3	1.8E4	3.7E3	H_2SO_4 values w/factor of $\frac{H_2SO_4}{SO_3} = \frac{98}{80}$
53	thiocyanate	SCN	58.1	1.1E4	5.0E2	1.0E2	HCN values
54	selenium	Se	79.0	2.0E2	5.0E1	1.0E1	
55	tellurium	Te	127.6	1.0E2	1.5E3	3.0E2	
56	fluorine	F_2, F^-	38.0	2.5E3	3.8E4	7.5E3	
57	chlorine	Cl_2, Cl^-	70.9	2.5E3	1.3E6	2.6E5	F air value
58	bromine	Br_2, Br^-	159.8	7.0E3	1.3E6	2.6E5	HCl air value; Cl^- water & land value
59	iodine	I_2, I^-	253.8	7.0E3	1.3E6	2.6E5	Same as Br_2
60	scandium	Sc	45.0	5.3E4	8.0E5	1.6E5	
61	yttrium	Y^{+3}	88.9	1.0E3	1.5E4	3.0E3	
62	titanium	Ti	47.9	6.0E3	9.0E4	1.8E4	
62	titanium dioxide	TiO_2	79.9	6.0E3	9.0E4	1.8E4	

*DMEG = Discharge Multimedia Environmental Goal, based upon health effects.

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TABLE 2-1. DMEG* VALUES FOR SELECTED CHEMICAL COMPOUNDS

MEG Category	Chemical Name	Chemical Formula	Molecular Weight	DMEG (health) Air ($\mu g/m^3$)	Water ($\mu g/\ell$)	Land ($\mu g/g$)	Notes
63	zirconium	Zr^{++}	91.2	5.0E3	5.7E4	1.5E3	
64	hafnium	Hf^{+4}	178.5	5.0E2	7.5E4	1.5E2	
65	vanadium	V	50.9	5.0E2	2.5E3	5.0E2	
66	niobium	Nb^{+3},Nb^{+5}	92.9	2.2E4	3.3E5	6.5E4	
68	chromium	Cr	52.0	1.0E0	8.0E1	1.6E-2	
69	molybdenum	Mo	95.9	5.0E3	7.5E4	1.5E4	
70	tunsten	W	183.9	1.0E3	1.5E4	3.0E3	
71	manganese	Mn	54.9	5.0E3	2.5E2	5.0E1	
72	iron	Fe^{+2},Fe^{+3}	55.8	1.0E3	1.5E3	3.0E2	
72	ferric oxide	Fe_2O_3	159.6	5.0E3	7.5E4	1.5E2	FeO values
72	iron carbonyls	$Fe(CO)_n$		7.0E2	1.1E4	2.1E3	
74	cobalt	Co	58.9	5.0E1	7.5E2	1.5E2	
76	nickel	Ni	58.7	1.5E1	2.5E2	5.0E1	
76	nickel carbonyl	$Ni(CO)_4$	170.7	4.3E1	6.5E2	1.0E2	
77	platinum	Pt	195.1	2.0E0	3.0E1	6.0E0	
78	copper	Cu	63.5	2.0E2	5.0E3	1.0E3	
79	silver	Ag	107.9	1.0E1	5.0E1	1.0E1	
80	gold	Au	197.0	1.0E1	2.5E2	5.0E1	Ag values
81	zinc	Zn	65.4	4.0E3	2.5E4	5.0E3	
82	cadmium	Cd	112.4	1.0E1	5.0E1	2.0E-1	
83	mercury	Hg	200.6	5.0E1	1.0E0	2.0E-1	
84	cerium	Ce	140.1	3.7E4	5.5E5	1.1E5	

*DMEG = Discharge Multimedia Environmental Goal, based upon health effects.

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TABLE2-1. DMEG* VALUES FOR SELECTED CHEMICAL COMPOUNDS

MEG Category	Chemical Name	Chemical Formula	Molecular Weight	DMEG (health) Air ($\mu g/m^3$)	Water ($\mu g/\ell$)	Land ($\mu g/g$)	Notes
84	dysprosium	Dy	162.5	9.3E3	2.3E5	4.6E4	
	erbium	Er	167.3	9.3E3	2.3E5	4.6E4	Dy^{+3} values (worst 84)
	europium	Eu	152.0	9.3E3	2.3E5	4.6E4	Dy^{+3} values (worst 84)
	gadolinium	Gd	157.3	9.3E3	2.3E5	4.6E4	Dy^{+3} values (worst 84)
	holmium	Ho	164.9	9.3E3	2.3E5	4.6E4	Dy^{+3} values (worst 84)
84	lanthanum	La	138.9	1.1E5	1.7E6	3.4E5	
	lutetium	Lu	175.0	9.3E3	2.3E5	4.6E4	Dy^{+3} values (worst 84)
84	neodymium	Nd^{+3}	144.2	9.3E3	2.3E5	4.6E4	Dy^{+3} values (worst 84)
84	praseodymium	Pr^{+3}	140.9	5.1E4	7.7E5	1.5E5	
84	samarium	Sm^{+3}	150.4	5.3E4	7.9E5	1.6E5	
	terbium	Tb	158.9	9.3E3	2.3E5	4.6E4	Dy^{+3} values (worst 84)
	thulium	Tm	168.9	9.3E3	2.3E5	4.6E4	Dy^{+3} values (worst 84)
	ytterbium	Yb	173.0	9.3E3	2.3E5	4.6E4	Dy^{+3} values (worst 84)
85	thorium	Th^{+4}	232.0	4.2E2	6.3E3	1.3E2	
85	uranium	U^{+6}	238.0	9.0E0	6.0E4	1.2E4	
	hydrogen	H_2	2.0	4.1E5	-	-	Considered an asphyxiant

*DMEG = Discharge Multimedia Environmental Goal, based upon health effects.

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TABLE3-1. SUMMARY DISCHARGE SEVERITY MEASURES FOR SYNTHETIC FUEL PROCESSES

Process: Wellman-Galusha — Product Flow Rate: 1.2E0 Nm^3/s (1.5E5 SCF/hr)

Coal Type: Anthracite — Product Heating Value: 5.1E6 J/Nm^3 (1.4E2 Btu/SCF)

Coal Rate (CR): 2.2E2 g/s (8.5E-1 T/hr) — Energy Production Rate (ER): 6.2E6 J/s (2.1E7 Btu/hr)

Stream	Stream Flow Rate	$\sum$DS	$\sum$WDS	$\sum$WDS/CR	$\sum$WDS/ER	No. Compounds Identified	No. Compounds with DS≥1
Poke Hole Gas	1.7E0 g/s	7.13E3	1.21E4 g/s	5.51E1 g/g	1.95E-3 g/J	20	10
Coal Hopper Gas	2.2E0 g/s	7.07E3	1.55E4 g/s	7.07E1 g/g	2.51E-3 g/J	8	6
Gasifier Ash	2.1E1 g/s	1.29E3	2.70E4 g/s	1.23E2 g/g	4.36E-3 g/J	66	8
Ash Sluice Water	2.1E1 g/s	6.76E2	1.42E4 g/s	6.45E1 g/g	2.29E-3 g/J	66	8
Cyclone Dust	1.9E-1 g/s	1.99E2	3.79E2 g/s	1.72E0 g/g	6.11E-5 g/J	70	9

TABLE 3-2. ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Wellman-Galusha

Coal Type: Anthracite

Stream Description: Pokehole Gas Discharge

Stream Flow Rate: 1.5E-3 Nm^3/s, _____ ℓ/s, 1.7E0 g/s

Coal Feed Rate (CR): 2.2E2 g/s (8.5E-1 tph)

Product Flow Rate: 1.2 Nm^3/s (1.5E5 SCFH)

Product Heating Value: 5.1E6 J/Nm^3 (1.4E2 Btu/SCF)

Energy Production Rate (ER): 6.2E6 J/s (2.1E7 Btu/hr)

continued

TABLE 3-2 CONTINUED.

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	methane	1.3E6	3.9E-1	6.6E-1	8.9E0	3.1E-4	13
01A	ethane	3.8E2	6.2E-5	1.1E-4	2.6E-3	9.2E-8	20
01A	propane	7.8E3	8.7E-4	1.5E-3	5.3E-2	1.9E-6	19
27	lithium	5.2E1	2.4E0	4.1E0	3.5E-4	1.3E-8	8
39	gallium	1.1E1	2.2E-3	3.7E-6	7.5E-5	2.7E-9	18
42	carbon dioxide	9.6E7	1.1E1	1.0E1	6.5E2	2.3E-2	4
42	carbon monoxide	2.8E8	7.0E3	1.2E4	1.9E3	6.8E-2	1
47	ammonia	1.3E5	7.2E0	1.2E1	8.9E-1	3.1E-5	5
47	hydrogen cyanide	3.6E4	7.2E0	1.2E1	2.5E-1	8.7E-6	5
49	arsenic	5.2E1	2.6E1	4.4E1	3.5E-4	1.3E-8	3
53	carbon disulfide	2.6E3	4.3E-2	7.3E-2	1.8E-2	6.3E-7	17
53	carbonyl sulfide	2.3E5	5.2E-1	8.8E1	1.6E-0	5.6E-5	12

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

TABLE 3-2 CONTINUED.

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
53	hydrogen sulfide	9.6E5	6.4E1	1.1E2	6.5E0	2.3E-4	2
53	sulfur dioxide	6.9E4	5.3E0	9.0E0	4.7E-1	1.7E-5	7
53	thiocyanate	2.0E4	(1.8E0)	(3.1E0)	1.4E-1	4.8E-6	9
54	selenium	1.8E1	9.0E-2	1.5E-1	1.2E-4	4.4E-9	15
62	titanium	7.7E2	1.3E-1	2.2E-1	5.3E-3	1.9E-7	14
72	iron	8.2E1	8.2E-2	1.4E-1	5.6E-4	2.0E-8	16
76	nickel	2.2E1	1.5E0	2.6E0	1.5E-4	5.3E-9	10
76	nickel carbonyl	2.9E1	6.7E-1	1.1E0	2.0E-4	7.0E-9	11
		Values same without supplemental MEG values					

$\sum DS$ = 7.13E3

$\sum WDS$ = 1.21E4 g/s

$\sum WDS/CR$ = 5.51E1 g/g

$\sum WDS/ER$ = 1.95E-3 g/J

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TABLE 3-3 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Wellman-Galusha

Coal Type: Anthracite

Stream Description: Coal Hopper Gas Discharge

Stream Flow Rate: 1.9E-3 m^3/s, ____ ℓ/s, 2.2E0 g/s

Coal Feed Rate (CR): 2.2E2 g/s (8.5E-1 tph)

Product Flow Rate: 1.2 Nm^3/s (1.5E5 SCFH)

Product Heating Value: 5.1E6 J/Nm^3 (1.4E2 Btu/SCF)

Energy Production Rate (ER): 6.2E6 J/s (2.1E7 Btu/hr)

continued

TABLE 3-3 CONTINUED.

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	methane	1.4E6	4.2E-1	9.2E-1	1.2E1	4.3E-4	7
42	carbon di-oxide	8.5E7	9.4E0	2.1E1	7.3E2	2.6E-2	5
42	carbon mon-oxide	2.7E8	6.8E3	1.5E4	2.3E3	8.3E-2	1
53	carbon disul-fide	1.6E3	4.2E-1	9.2E-1	1.4E-2	4.9E-7	7
53	carbonyl sul-fide	1.5E5	3.9E1	8.6E1	1.3E0	4.6E-5	3
53	hydrogen sul-fide	4.1E5	2.7E1	5.9E1	3.5E0	1.3E-4	4
53	sulfur dioxide	1.3E4	1.0E0	2.2E0	1.1E-1	4.0E-6	6
72	iron carbonyl	1.3E5	1.9E2	4.2E2	1.1E0	4.0E-5	2
		No supplemental MEG Values used					

$\sum DS$ = 7.07E3

$\sum WDS$ = 1.55E4 g/s

$\sum WDS/CR$ = 7.07E1 g/g

$\sum WDS/ER$ = 2.51E-3 g/J

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TABLE 3-4. ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Wellman-Galusha

Coal Type: Anthracite

Stream Description: Gasifier Ash (dry) Discharge

Stream Flow Rate: _____ m^3/s, _____ ℓ/s, 2.1E1 g/s

Coal Feed Rate (CR): 2.2E2 g/s (8.5E-1 tph)

Product Flow Rate: 1.2E0 Nm^3/s (1.5E5 SCFH)

Product Heating Value: 5.1E6 J/Nm^3 (1.4E2 Btu/SCF)

Energy Production Rate (ER): 6.2E6 J/s (2.1E7 Btu/hr)

continued

TABLE 3-4 CONTINUED

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
08D	phthalate esters	7.1E-1	4.7E-3	9.9E-6	6.8E-2	2.4E-6	33
27	lithium	2.4E2	3.4E0	7.1E1	2.3E1	8.1E-4	3
28	sodium	1.0E3	5.0E-2	1.1E0	9.5E1	3.4E-3	23
29	potassium	1.0E3	(1.7E-1)	(3.6E0)	9.5E1	3.4E-3	17
30	rubidium	1.5E2	4.2E-4	8.8E-3	1.4E1	5.1E-4	49
31	cesium	1.0E1	4.0E-5	8.4E-4	9.5E-1	3.4E-5	58
32	beryllium	1.0E0	5.9E-1	1.2E1	9.5E-2	3.4E-6	9
33	magnesium	1.0E3	5.6E-3	1.2E-1	9.5E1	3.4E-3	30
	rhenium	1.0E-1	(5.6E-6)	(1.2E-4)	9.5E-3	3.4E-7	64
34	calcium	1.0E3	2.1E-2	4.4E-1	9.5E1	3.4E-3	26
35	strontium	4.9E2	5.3E-2	1.1E0	4.7E1	1.7E-3	22
36	barium	1.0E3	1.0E0	2.1E1	9.5E1	3.4E-3	8
37	boron	1.3E1	1.4E-3	2.9E-2	1.2E0	4.4E-5	40

$\sum$DS = _____

$\sum$WDS = _____

$\sum$WDS/CR = _____

$\sum$WDS/ER = _____

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TABLE 3-4 CONTINUED

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
38	aluminum	1.0E3	6.3E-2	1.3E-0	9.5E1	3.4E-3	20
39	gallium	2.2E1	1.5E-3	3.2E-2	2.1E0	7.5E-5	39
41	thallium	3.0E-1	1.0E-3	2.1E-2	2.9E-2	1.0E-6	41
43	silicon	1.0E3	3.3E-2	6.9E-1	9.5E1	3.4E-3	25
44	germanium	1.0E0	5.9E-4	1.2E-2	9.5E-2	3.4E-6	46
45	tin	2.0E0	3.3E-4	7.0E-3	1.9E-1	6.8E-6	51
46	lead	1.2E1	2.4E-1	5.0E0	1.1E0	4.1E-5	12
48	phosphate	1.0E3	(3.3E-1)	(6.9E0)	9.5E1	3.4E-3	11
49	arsenic	3.0E1	7.5E1	1.6E3	2.9E0	1.0E-4	2
50	antimony	5.0E-1	3.3E-3	6.9E-2	4.8E-2	1.7E-6	35
51	bismuth	1.8E1	1.5E-2	3.2E-1	1.7E0	6.1E-5	28
53	sulfur	7.7E1	(1.9E-3)	(4.0E-2)	7.4E0	2.6E-4	37
54	selenium	2.0E0	2.0E-1	4.2E0	1.9E-1	6.8E-6	15
55	tellurium	2.0E-1	6.7E-4	1.4E-2	1.9E-2	6.8E-7	44

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

TABLE 3-4 CONTINUED.

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
56	fluoride	5.9E1	7.9E-3	1.7E-1	5.6E0	2.0E-4	30
57	chloride	1.0E2	3.8E-4	8.0E-3	9.5E0	3.4E-4	50
58	bromide	6.0E0	(2.3E-5)	(4.8E-4)	5.7E-1	2.0E-5	59
59	iodide	3.0E-1	(1.2E-6)	(2.5E-5)	2.9E-2	1.0E-6	66
60	scandium	9.0E0	5.6E-5	1.2E-3	8.6E-1	3.0E-5	54
61	yttrium	5.6E1	1.9E-2	4.0E-1	5.3E0	1.9E-4	27
62	titanium	1.0E3	5.6E-2	1.2E0	9.5E1	3.4E-3	21
63	zirconium	3.5E2	2.3E-1	4.8E0	3.3E1	1.2E-3	13
64	hafnium	2.0E0	1.3E-2	2.7E-1	1.9E-1	6.8E-6	29
65	vanadium	2.0E2	4.0E-1	8.4E0	1.9E1	6.8E-4	10
66	niobium	3.5E1	5.4E-4	1.1E-2	3.3E0	1.2E-4	47
68	chromium	1.9E2	1.2E3	2.5E4	1.8E1	6.4E-4	1
69	molybdenum	1.5E1	1.0E-3	2.1E-2	1.4E1	5.1E-4	41

$\sum DS$ = _____

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

TABLE 3-4 CONTINUED

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
70	tungsten	2.0E0	6.7E-4	1.4E-2	1.9E-1	6.8E-6	44
71	manganese	6.9E1	1.4E0	2.9E1	6.6E0	2.3E-4	5
72	iron	1.0E3	3.3E0	6.9E1	9.5E1	3.4E-3	4
74	cobalt	2.3E1	1.5E-1	3.2E0	2.2E0	7.8E-5	18
76	nickel	6.2E1	1.2E0	2.6E1	6.9E0	2.1E-4	7
78	copper	2.0E2	2.0E-1	4.2E0	1.9E1	6.8E-4	15
79	silver	1.0E0	1.0E-1	2.1E0	9.5E-2	2.3E-7	19
81	zinc	1.8E1	3.6E-3	7.6E-2	1.7E0	6.1E-5	34
82	cadmium	4.0E-1	4.0E-2	8.4E-1	3.8E-2	1.4E-6	23
83	mercury	2.8E-1	1.4E0	2.9E1	2.7E-2	9.5E-7	5
84	cerium	1.8E2	1.6E-3	3.4E-2	1.7E1	6.1E-4	38
84	dysprosium	3.0E0	6.5E-5	1.4E-3	2.9E-1	1.0E-5	53
	erbium	1.0E0	(2.2E-5)	(4.6E-4)	4.5E-2	2.3E-7	60

$\sum DS$ = _____

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

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TABLE 3-4 CONTINUED

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
	europium	1.0E0	(2.2E-5)	(4.6E-4)	9.5E-2	2.3E-7	60
	gadolinium	2.0E0	(4.3E-5)	(9.0E-4)	1.9E-1	6.8E-6	55
	holmium	2.0E0	(4.3E-5)	(9.0E-4)	1.9E-1	6.8E-6	55
84	lanthanum	1.6E2	(4.7E-4)	9.9E-3	1.5E0	5.4E-4	48
	lutetium	3.0E-1	(6.5E-6)	(1.4E-4)	2.9E-2	1.0E-6	63
84	neodymium	3.4E1	(7.4E-4)	(1.6E-2)	3.2E0	1.2E-4	43
84	praseodymium	1.6E1	1.1E-4	2.3E-3	1.5E0	5.4E-5	52
84	samarium	1.1E1	6.9E-5	1.4E-3	1.1E0	2.7E-5	53
	terbium	6.0E-1	(1.3E-5)	(2.7E-4)	6.7E-2	2.0E-6	62
	thulium	2.0E-1	(4.3E-6)	(9.0E-5)	1.9E-2	6.8E-7	65
	ytterbium	2.0E0	(4.3E-5)	(9.0E-4)	1.9E-1	6.8E-6	55
85	thorium	2.9E1	2.2E-1	4.6E0	2.8E0	9.8E-5	14
85	uranium	3.2E1	2.7E-3	5.7E2	3.1E0	1.1E-4	36

$\sum DS$ = 1.29E3 (1.29E3)

$\sum WDS$ = 2.70E4 (2.70E4) g/sec

$\sum WDS/CR$ = 1.23E2 (1.23E2) g/g

$\sum WDS/ER$ = 4.36E-3 (4.36E-3) g/J

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TABLE 3-5 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Wellman-Galusha

Coal Type: Anthracite

Stream Description: Ash Sluice Water Discharge

Stream Flow Rate:	____ m^3/s, 2.1E-2	t/s, 2.1E1	g/s
Coal Feed Rate (CR):	2.2E2	g/s (8.5E-1	tph)
Product Flow Rate:	1.2E0	Nm^3/s (1.5E5	SCFH)
Product Heating Value:	5.1E6	J/Nm^3 (1.4E2	Btu/SCF)
Energy Production Rate (ER):	6.2E6	J/s (2.1E7	Btu/hr)

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TABLE 3-5 CONTINUED

MEG Category	Chemical Name	Concentration (µg/ℓ)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
08D	phthalate esters	4.0E1	5.3E-4	1.1E-2	3.8E-3	1.4E-7	41
27	lithium	4.0E2	1.2E0	2.5E1	3.8E-2	1.4E-6	7
28	sodium	1.0E3	1.0E-1	2.1E0	9.5E-2	3.4E-6	18
29	potassium	6.0E3	2.0E-1	4.2E0	5.7E-1	2.0E-5	10
30	rubidium	2.0E2	1.1E-4	2.3E-3	1.9E-2	6.8E-7	46
31	cesium	3.0E0	2.5E-6	5.3E-5	2.9E-4	1.0E-8	64
32	beryllium	1.0E0	1.1E-1	2.3E0	9.5E-5	3.4E-9	15
33	magnesium	5.0E3	5.6E-2	1.2E0	4.8E-1	1.7E-5	24
34	calcium	1.0E4	4.2E-2	8.8E-1	9.5E-1	3.4E-5	25
35	strontium	3.0E3	6.5E-2	1.4E0	2.9E-1	1.0E-5	22
36	barium	1.0E4	2.0E-0	4.2E1	9.5E-1	3.4E-5	6
37	boron	1.0E0	2.1E-5	4.4E-4	9.5E-5	3.4E-9	51
38	aluminum	5.0E2	6.3E-3	1.3E-1	4.8E-2	1.7E-6	32

$\sum DS$ = _____

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

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TABLE 3-5 CONTINUED

MEG Category	Chemical Name	Concentration (µg/ℓ)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
39	gallium	4.0E1	5.4E-2	1.1E-2	3.8E-3	1.4E-7	40
43	silicon	1.0E4	6.7E-2	1.4E0	9.5E-1	3.4E-5	21
44	germanium	1.0E0	1.2E-4	2.5E-3	9.5E-5	3.4E-9	45
45	tin	4.0E0	1.3E-4	2.7E-3	3.8E-4	1.4E-8	44
46	lead	2.0E1	8.0E-2	1.7E0	1.9E-3	6.8E-8	19
47	ammonia	3.0E3	1.2E0	2.5E1	2.9E-1	1.0E-5	7
47	hydrogen cyanide	6.0E1	1.2E-1	2.5E0	5.7E-3	2.0E-7	12
47	nitrate	1.7E4	(1.2E-1)	(2.5E0)	1.6E0	5.8E-5	12
48	phosphate	1.7E3	(1.1E-1)	(2.3E0)	1.6E-1	5.8E-6	15
49	arsenic	4.0E1	2.0E1	4.2E2	3.8E-3	1.4E-7	2
50	antimony	4.0E0	5.5E-3	1.2E-1	3.8E-4	1.4E-8	34
53	sulfur	3.0E3	(1.5E-2)	(3.2E-1)	2.9E-1	1.0E-5	30
53	sulfate	9.5E4	7.3E-2	1.5E0	9.1E0	3.2E-4	20

$\sum$DS = _____ $\sum$WDS/CR = _____

$\sum$WDS = _____ $\sum$WDS/ER = _____

TABLE 3-5 CONTINUED

MEG Category	Chemical Name	Concentration (µg/ℓ)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
53	sulfide	3.0E3	1.2E1	2.5E2	2.9E-1	1.0E-5	3
53	thiocyanate	2.0E3	(4.0E0)	(8.4E1)	1.9E-1	6.8E-6	4
54	selenium	2.0E1	4.0E-1	8.4E0	1.9E-3	6.8E-8	9
56	fluoride	6.0E2	1.6E-2	3.4E1	5.7E-2	2.0E-6	29
57	chloride	1.7E4	1.3E-2	2.7E-1	1.6E0	5.8E-5	31
58	bromide	1.0E1	(7.7E-6)	(1.6E-4)	9.5E-4	3.4E-8	65
59	iodide	1.0E0	(7.7E-7)	(1.6E-5)	9.5E-5	3.9E-9	65
60	scandium	7.0E0	8.8E-6	1.8E-4	6.7E-4	2.4E-8	56
61	yttrium	4.0E1	2.7E-3	5.7E-2	3.8E-3	1.4E-7	38
62	titanium	1.0E4	1.1E-1	2.3E-0	9.5E-1	3.4E-5	15
63	zirconium	2.0E2	3.5E-3	7.4E-2	1.9E-2	6.8E-7	36
65	vanadium	5.0E2	2.0E-1	4.2E0	4.8E-2	1.7E-6	10
66	niobium	3.0E1	9.1E-5	1.9E-3	2.9E-3	1.0E-7	47

ΣDS = _____

ΣWDS = _____

$\Sigma WDS/CR$ = _____

$\Sigma WDS/ER$ = _____

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TABLE 3-5 CONTINUED.

MEG Category	Chemical Name	Concentration (µg/ℓ)	Discharge Severity	Weighted Discharge Severity	Production Factors µg/g coal	Production Factors µg/J Product	Discharge Severity Ranking
68	chromium	5.0E2	6.3E2	1.3E4	4.8E-2	1.7E-6	1
69	molybdenum	4.0E2	5.3E-3	1.1E-1	3.8E-2	1.4E-6	35
70	tungsten	1.0E1	6.7E-4	1.4E-2	9.5E-4	3.4E-8	39
71	manganese	1.0E1	4.0E-2	8.4E-1	9.5E-4	3.4E-8	25
72	iron	5.0E3	3.3E0	6.9E1	4.4E-1	1.75-5	5
74	cobalt	4.0E1	5.3E-2	1.1E0	3.8E-3	1.4E-7	23
76	nickel	3.0E1	1.2E-1	2.5E0	2.9E-3	1.0E-7	14
78	copper	1.0E2	2.0E-2	4.2E-1	9.5E-3	3.4E-7	27
79	silver	2.0E0	4.0E-2	8.4E-1	1.9E-4	6.8E-9	25
81	zinc	7.0E1	2.8E-3	5.9E-2	6.7E-3	2.4E-7	37
82	cadmium	3.0E0	6.0E-2	1.3E0	2.9E-4	1.0E-8	22
84	cerium	1.0E2	1.8E-4	3.8E-3	9.5E-3	3.4E-7	42
84	dysprosium	3.0E0	1.3E-5	2.7E-4	2.9E-4	1.0E-8	52

$\sum$DS = _____ $\sum$WDS/CR = _____

$\sum$WDS = _____ $\sum$WDS/ER = _____

TABLE 3-5 CONTINUED.

MEG Category	Chemical Name	Concentration (µg/ℓ)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
	erbium	1.0E0	(4.3E-6)	(9.0E-5)	9.5E-5	3.4E-9	59
	europium	1.0E0	(4.3E-6)	(9.0E-5)	9.5E-5	3.4E-9	59
	gadolinium	2.0E0	(8.7E-6)	(1.8E-4)	1.9E-4	6.8E-9	55
	holmium	2.0E0	(8.7E-6)	(1.8E-4)	1.9E-4	6.8E-9	55
84	lanthanum	5.0E1	2.9E-5	6.1E-4	4.8E-3	1.7E-7	49
	lutetium	1.0E0	(4.3E-6)	(9.0E-5)	9.5E-5	3.4E-9	59
84	neodymium	1.0E1	(4.3E-5)	(9.0E-4)	9.5E-4	3.4E-8	48
84	praseodymium	1.0E1	1.3E-5	2.7E-4	9.5E-4	3.4E-8	52
84	samarium	1.0E1	1.3E-5	2.7E-4	9.5E-4	3.4E-8	52
	terbium	1.0E0	(4.3E-6)	(9.0E-5)	9.5E-5	3.4E-9	59
	thulium	1.0E0	(4.3E-6)	(9.0E-5)	9.5E-5	3.4E-9	59
	ytterbium	2.0E0	(8.7E-6)	(1.8E-4)	1.9E-4	6.8E-9	55
85	thorium	4.0E1	6.3E-3	1.3E-1	3.8E-3	1.4E-7	32
85	uranium	1.0E1	1.7E-4	3.6E-3	9.5E-4	3.4E-8	43

$\sum DS$ = 6.76E2

$\sum WDS$ = 1.42E4 g/s

$\sum WDS/CR$ = 6.45E1 g/g

$\sum WDS/ER$ = 2.29E-3 g/J

Values same without supplemental MEG values

TABLE3-6. ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Wellman-Galusha

Coal Type: Anthracite

Stream Description: Cyclone Dust Discharge

Stream Flow Rate: _____ m^3/s, _____ ℓ/s, 1.9E-1 g/s

Coal Feed Rate (CR): 2.2E2 g/s (8.5E-1 tph)

Product Flow Rate: 1.2E0 Nm^3/s (1.5E5 SCFH)

Product Heating Value: 5.1E6 J/Nm^3 (1.4E2 Btu/SCF)

Energy Production Rate (ER): 6.2E6 J/s (2.1E7 Btu/hr)

continued

TABLE 3-6 CONTINUED

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
08D	phthalate esters	2.4E0	1.6E-4	3.0E-5	2.1E-3	7.4E-8	50
21A	naphthalene	4.0E-1	2.7E-6	5.1E-7	3.5E-4	1.2E-8	70
21A	phenanthrene	1.0E-1	2.1E-5	4.0E-6	8.6E-5	3.1E-9	62
22A	fluorene	1.0E-1	(7.1E-7)	(1.3E-7)	8.6E-5	3.1E-9	69
27	lithium	1.6E2	2.3E0	4.4E-1	1.4E-1	4.9E-6	6
28	sodium	1.0E3	5.0E-2	9.5E-3	8.6E-1	3.1E-5	28
29	potassium	1.0E3	(1.7E-1)	(3.2E-2)	8.6E-1	3.1E-5	20
30	rubidium	1.5E1	4.2E-5	8.0E-6	1.3E-2	4.6E-7	59
31	cesium	1.5E1	6.0E-5	1.1E-5	1.3E-2	4.6E-7	54
32	beryllium	8.0E-1	4.7E-1	8.9E-2	6.9E-4	2.5E-8	13
33	magnesium	1.0E3	5.6E-2	1.1E-2	8.6E-1	3.1E-5	26
	rhenium	1.0E-1	(5.6E-6)	(1.1E-6)	8.6E-5	3.1E-9	66
34	calcium	1.0E3	2.1E-2	4.0E-3	8.6E-1	3.1E-5	32

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

TABLE 3-6 CONTINUED.

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
35	strontium	2.7E2	2.9E-2	5.5E-3	2.3E-1	8.3E-6	31
36	barium	1.0E3	1.0E0	1.9E-1	8.6E-1	3.1E-5	9
37	boron	5.0E0	5.4E-4	1.0E-4	4.3E-3	1.5E-7	47
38	aluminum	1.0E3	6.3E-2	1.2E-2	8.6E-1	3.1E-5	25
39	gallium	2.2E2	1.5E-2	2.9E-3	1.9E-1	6.7E-6	35
41	thallium	2.2E1	7.3E-2	1.4E-2	1.9E-2	6.7E-7	21
43	silicon	1.0E3	3.3E-2	6.3E-3	8.6E-1	3.1E-5	29
44	germanium	1.1E1	6.5E-3	1.2E-3	9.5E-3	3.4E-7	37
45	tin	3.9E1	6.5E-3	1.2E-3	3.4E-2	1.2E-6	37
46	lead	2.3E2	4.6E0	8.7E-1	2.0E-1	7.0E-6	5
48	phosphate	1.0E3	(3.3E-1)	(6.3E-2)	8.6E-1	3.1E-5	16
49	arsenic	8.5E1	2.1E2	4.0E1	7.3E-2	2.6E-6	3
50	antimony	5.3E1	3.5E-1	6.7E-2	4.6E-2	1.6E-6	15

$\sum DS$ = _____

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

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MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
51	bismuth	3.0E0	2.5E-3	4.8E-4	2.6E-3	9.2E-8	42
53	sulfur	1.5E4	(3.8E-1)	(7.2E-2)	1.3E1	4.7E-4	14
54	selenium	1.6E1	1.6E0	3.0E-1	1.4E-2	4.9E-7	8
55	tellurium	9.0E-1	3.0E-3	5.7E-4	7.8E-4	2.8E-8	41
56	fluoride	2.4E2	3.2E-2	6.1E-3	2.1E-1	7.4E-6	30
57	chloride	1.0E2	3.8E-4	7.2E-5	8.6E-2	3.1E-6	48
58	bromide	1.1E1	(4.3E-5)	(8.0E-6)	9.5E-3	3.4E-7	58
59	iodide	2.4E1	(9.2E-5)	(1.7E-5)	2.1E-2	7.4E-7	52
60	scandium	7.0E0	4.4E-5	8.4E-6	6.0E-3	2.1E-7	55
61	yttrium	4.2E1	1.4E-2	2.7E-3	3.6E-2	1.3E-6	36
62	titanium	1.0E3	5.6E-2	1.1E-2	8.6E-1	3.1E-5	26
63	zirconium	1.1E2	7.3E-2	1.4E-2	9.5E-2	3.4E-6	21
64	hafnium	3.0E0	2.0E-2	3.8E-3	2.6E-3	9.2E-8	33
65	vanadium	1.5E2	3.0E-1	5.7E-2	1.3E-1	4.6E-6	17

$\sum$OS = _____

$\sum$WDS = _____

$\sum$WDS/CR = _____

$\sum$WDS/ER = _____

TABLE 3-6 CONTINUED

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
66	niobium	5.2E1	8.0E-4	1.5E-4	4.5E-2	1.6E-6	46
68	chromium	5.8E1	3.6E2	6.9E 1	5.0E-2	1.8E-6	2
69	molybdenum	5.7E1	3.8E-3	7.2E-4	4.9E-2	1.7E-6	39
70	tungsten	5.0E0	2.0E-3	3.8E-4	4.3E-3	1.5E-7	44
71	manganese	5.7E2	1.1E1	2.1E0	4.9E-1	1.7E-5	4
72	iron	1.0E3	3.3E0	6.3E-1	8.6E-1	3.1E-5	7
74	cobalt	1.0E1	6.7E-2	1.3E-2	8.6E-3	3.1E-7	24
76	nickel	4.7E1	9.4E-1	1.8E-1	4.1E-2	1.4E-6	10
78	copper	6.8E1	6.8E-2	1.3E-2	5.9E-2	2.1E-6	23
79	silver	5.0E0	5.0E-1	9.5E-2	4.3E-3	1.5E-7	12
80	gold	1.0E0	(2.0E-2)	(3.8E-3)	8.6E-4	3.1E-8	33
81	zinc	1.0E3	2.0E-1	3.8E-2	8.6E-1	3.1E-5	18
82	cadmium	2.0E0	2.0E-1	3.8E-2	1.7E-3	6.1E-8	18

ΣDS = _____

ΣWDS = _____

$\Sigma WDS/CR$ = _____

$\Sigma WDS/ER$ = _____

TABLE 3-6 CONTINUED

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
83	mercury	2.8E2	1.4E3	2.7E2	2.4E-1	8.6E-6	1
84	cerium	9.9E1	9.0E-4	1.7E-4	8.6E-2	3.0E-6	45
84	dysprosium	2.0E0	4.3E-5	8.2E-6	1.7E-3	6.1E-8	56
84	erbium	9.0E-1	(2.0E-5)	(3.8E-6)	7.8E-4	2.8E-8	63
84	europium	1.0E0	(2.2E-5)	(4.2E-6)	8.6E-4	3.1E-8	59
84	gadolinium	1.0E0	(2.2E-5)	(4.2E-6)	8.6E-4	3.1E-8	59
84	holmium	1.0E0	(2.2E-5)	(4.2E-6)	8.6E-4	3.1E-8	59
84	lanthanum	1.3E2	3.8E-4	7.2E-5	1.1E-1	4.0E-6	48
84	lutetium	3.0E-1	(6.5E-6)	(1.2E-6)	2.6E-4	9.2E-9	65
84	neodymium	1.1E2	(2.4E-3)	(4.6E-4)	9.5E-2	3.4E-6	43
84	praseodymium	3.5E1	2.3E-4	4.4E-6	3.0E-2	1.1E-6	50
84	samarium	1.1E1	6.9E-5	1.3E-5	9.5E-3	3.4E-7	53
84	terbium	6.0E-1	(1.3E-5)	(2.5E-6)	5.2E-4	1.8E-8	64

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TABLE 3-6 CONTINUED

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
84	thulium	2.0E-1	(4.3E-6)	(8.2E-7)	1.7E-4	6.1E-9	67
84	ytterbium	2.0E0	(4.3E-5)	(8.2E-6)	1.7E-3	6.1E-8	56
85	thorium	9.7E1	7.5E-1	1.4E-1	8.4E-2	3.0E-6	11
85	uranium	4.5E1	3.8E-3	7.2E-4	3.9E-2	1.4E-6	39

Excluding supplemental MEG values does not affect summaries

$\sum DS$ = 1.99E2

$\sum WDS$ = 3.79E2 g/sec

$\sum WDS/CR$ = 1.72E0 g/g

$\sum WDS/ER$ = 6.11E-5 g/J

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TABLE 3-7. RANKING OF COMPOUNDS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Wellman-Galusha Stream Description: Poke Hole Gas

Coal Type: Anthracite Stream Flow Rate: 1.7E0 g/s

Stream Type: Gaseous

Ranking	MEG Category	Compound	Discharge Severity Order of Magnitude
1	42	carbon monoxide	10,000
2	53	hydrogen sulfide	100
3	49	arsenic	10
4	42	carbon dioxide	10
5	47	ammonia	10
6	47	hydrogen cyanide	10
7	53	sulfur dioxide	10
8	27	lithium	1
9*	53	thiocyanate	1
10	76	nickel	1

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TABLE 3-8 RANKING OF COMPOUNDS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Wellman-Galusha Stream Description: Coal Hopper Gas

Coal Type: Anthracite Stream Flow Rate: 2.2E0 g/s

Stream Type: Gaseous

Ranking	MEG Category	Compound	Discharge Severity Order of Magnitude
1	42	carbon monoxide	10,000
2	72	iron carbonyl	100
3	53	carbonyl sulfide	10
4	53	hydrogen sulfide	10
5	42	carbon dioxide	10
6	53	sulfur dioxide	1

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TABLE 3-9 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Wellman-Galusha
Stream Description: Gasifier Ash (dry)
Coal Type: Anthracite
Stream Flow Rate: 2.1E1 g/s
Stream Type: Solid

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	68	chromium	1,000
2	49	arsenic	100
3	27	lithium	1
4	72	iron	1
5	71	manganese	1
5	83	mercury	1
7	76	nickel	1
8	36	barium	1

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TABLE 3-10 RANKING OF COMPOUNDS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Wellman-Galusha Stream Description: Ash Sluice Water

Coal Type: Anthracite Stream Flow Rate: 2.1E1 g/s

Stream Type: Liquid

Ranking	MEG Category	Compound	Discharge Severity Order of Magnitude
1	78	chromium	1000
2	49	arsenic	10
3	53	sulfide	10
4*	53	thiocyanate	1
5	72	iron	1
6	36	barium	1
7	27	lithium	1
7	47	ammonia	1

*Based on supplemental MEG values

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TABLE 3-11 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Wellman-Galusha Stream Description: Cyclone Dust

Coal Type: Anthracite Stream Flow Rate: 1.9E-1 g/s

Stream Type: Solid

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	83	mercury	1,000
2	68	chromium	1,000
3	49	arsenic	100
4	71	manganese	10
5	46	lead	1
6	27	lithium	1
7	72	iron	1
8	54	selenium	1
9	36	barium	1

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TABLE 3-12 RANKING OF POLLUTANTS VIA DISCHARGE SEVERITY BY PHASE

Process: Wellman-Galusha

Coal Type: Anthracite

Stream Type: Solid

Ranking	MEG Category	POLLUTANT	Discharge Severity Order of Magnitude
1	83	mercury	1,000
2	68	chromium	100
3	49	arsenic	100
4	77	manganese	10
5	46	lead	1
6	72	iron	1
7	27	lithium	1
8	54	selenium	1
9	76	nickel	1
10	36	barium	1

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TABLE 3-13 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Wellman-Galusha

Coal Type: Anthracite

Stream Type: Liquid

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	78	chromium	1000
2	49	arsenic	10
3	53	sulfide	10
4*	53	thiocyanate	1
5	72	iron	1
6	36	barium	1
7	27	lithium	1
7	47	ammonia	1

* Based on supplemental MEG values

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TABLE3-14 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Wellman-Galusha

Coal Type: Anthracite

Stream Type: Gaseous

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	42	carbon monoxide	10,000
2	72	iron carbonyl**	100
3	53	hydrogen sulfide	100
4	53	carbonyl sulfide	10
5	49	arsenic	10
6-	42	carbon dioxide	10
7	47	ammonia	10
8	47	hydrogen cyanide	10
9	53	sulfur dioxide	10
10	27	lithium	1
11*	53	thiocyanate	1
12	76	nickel	1

** Inferred concentration

* Based on supplemental MEG values

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TABLE 3-15 RANKING OF POLLUTANTS VIA WEIGHTED DISCHARGE SEVERITY BY PHASE

Process: Wellman-Galusha (Glen-Gery)

Coal Type: Anthracite

Stream Type: Solid

Ranking	MEG Category	Pollutant	WDS/Coal Input
1	68	chromium	3.8E-3 g/J
2	49	arsenic	2.4E-4
3	83	mercury	4.1E-5
4	27	lithium	1.1E-5
5	72	iron	1.1E-5
6	71	manganese	4.4E-6
7	76	nickel	4.4E-6
8	36	barium	3.2E-6
9	46	lead	7.6E-7
10	54	selenium	6.4E-7

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TABLE 3-16 RANKING OF POLLUTANTS VIA WEIGHTED DISCHARGE SEVERITY BY PHASE

Process: Wellman-Galusha (Glen-Gery)

Coal Type: Anthracite

Stream Type: Liquid

Ranking	MEG Category	Pollutant	WDS/Coal Input
1	68	chromium	2.0E-3 g/J
2	49	arsenic	6.4E-5
3	53	sulfide	3.8E-5
4*	53	thiocyanate	1.3E-5
5	72	iron	1.0E-5
6	36	barium	6.4E-6
7	27	lithium	3.8E-6
7	47	ammonia	3.8E-6

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TABLE 3-17 RANKING OF POLLUTANTS VIA WEIGHTED DISCHARGE SEVERITY BY PHASE

Process: Wellman-Galusha (Glen-Gery)

Coal Type: Anthracite

Stream Type: Gaseous

Ranking	MEG Category	Pollutant	WDS/ Coal Input
1	42	carbon monoxide	2.3E-3 g/J
2	72	iron carbonyl**	6.4E-5
3	53	hydrogen sulfide	1.7E-5
4	53	carbonyl sulfide	1.3E-5
5	49	arsenic	6.7E-6
6	42	carbon dioxide	3.2E-6
7	47	ammonia	1.8E-6
8	47	hydrogen cyanide	1.8E-6
9	53	sulfur dioxide	1.4E-6
10	27	lithium	6.2E-7
11*	53	thiocyanate	4.7E-7
12	76	nickel	3.9E-7

* Based on supplemental MEG values

** inferred concentration

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TABLE4-1. SUMMARY DISCHARGE SEVERITY MEASURES FOR SYNTHETIC FUEL PROCESSES

Process: Wellman-Galusha (Ft. Snelling, MN) Product Flow Rate: 5.8E-1* Nm^3/s (7.4E-4 SCF/hr)

Coal Type: (Indian Head) Lignite Product Heating Value: 5.1E6** J/Nm^3 (1.4E2 Btu/SCF)

Coal Rate (CR): 2.8E2 g/s (1.13E0 T/hr) Energy Production Rate (ER): 3.0E6 J/s (1.0E7 Btu/hr)

Stream	Stream Flow Rate	$\sum$DS	$\sum$WDS	$\sum$WDS/CR	$\sum$WDS/ER	No. Compounds Identified	No. Compounds with DS≥1
Product Gas	5.92E g/s	1.09E4	6.43E6 g/s	2.26E4 g/g	2.14E0 g/J	81	31
Gasifier Ash	2.42E1 g/s	1.05E3	2.53E4 g/s	8.87E1 g/g	8.43E-3 g/J	52	13
Cyclone Dust	3.8E0 g/s	2.75E2	1.04E3 g/s	3.66E0 g/g	3.48E-4	55	6
Ash Sluice Water	7.0E0 g/s	1.98E2	1.39E3 g/s	4.87E0 g/g	4.63E-4 g/J	50	9
Cyclone Quench Water	7.0E0 g/s	9.51E1	6.66E2 g/s	2.34E0 g/g	2.22E-4 g/J	50	4
Service Water	N/A	9.74E-1	***	***	***	30	1
Coal Bin Vent Gas	N/A	2.14E-4	***	***	***	5	0

*Uses product density of 1.01E3 g/Nm^3 as reported for Wellman-Galusha (Glen-Gery) process.

**Uses product heating value as reported for Wellman-Galusha (Glen-Gery) process.

***No flow rate available.

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TABLE 4-2. ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Wellman-Galusha (Ft. Snelling, MN)

Coal Type: North Dakota (Indian Head) Lignite

Stream Description: Product Gas - (Product)

Stream Flow Rate:* 5.8E-1 Nm^3/s, ——— ℓ/s, 5.9E2 g/s

Coal Feed Rate (CR): 2.85E2 g/s (1.13E0 tph)

Product Flow Rate:* 5.8E-1 Nm^3/s (7.4E4 SCFH)

Product Heating Value:** 5.1E6 J/Nm^3 (1.4E2 Btu/SCF)

Energy Production Rate (ER): 3.0E6 J/s (1.0E7 Btu/hr)

*Uses product density of 1.01E3 g/Nm^3 as reported for Wellman-Galusha (Glen-Gery) process.
**Uses product heating value based on Wellman-Galusha (Glen-Gery) process.

continued

Table 4-2. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
15A	benzene	>1.3E4	4.3E0	2.5E3	2.6E1	2.5E-8	23
15A	toluene	2.6E2	6.9E-4	4.1E-1	5.3E-1	5.0E-5	61
15A	ethylbenzene	3.9E1	9.0E-5	5.3E-2	7.9E-2	7.5E-6	76
15A	biphenyl	5.1E3	5.0E0	3.0E3	1.0E1	9.9E-4	21
15B	o-xylene	4.8E1	1.1E-4	6.5E-2	9.8E-2	9.3E-6	72
15B	m-and-p xylene	4.8E1	1.1E-4	6.5E-2	9.8E-2	9.3E-6	72
16A	polychlorinated biphenyls (PCB)	≤1.5E1	1.5E1	8.9E3	3.1E-2	2.9E-6	13
17A	dinitrotoluenes	2.2E3	1.5E0	8.9E2	4.5E0	4.3E-4	25
20B	dinitrocresol	1.8E3	9.0E0	5.2E3	3.7E0	3.5E-4	16
21B	benzo (a) anthracene	1.8E3	4.0E1	2.4E4	3.7E0	3.5E-4	8
21B	7,12-dimethyl-benzo (a) anthracene	1.6E2	6.2E2	3.7E5	3.3E-1	3.1E-5	2
21B	3-methyl cholanthrene	4.7E0	1.2E0	7.1E2	9.6E-3	9.1E-7	30

$\sum DS$ = _____

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

Table 4-2. Continued

HEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
21B	benzo (c) phenanthrane	1.0E3	4.5E0	2.7E3	2.0E0	1.9E-4	22
21C	dibenzo (a,h) anthracene	6.1E0	6.6E1	3.9E4	1.2E-2	1.2E-6	7
21C	benzo (a) pyrene	1.9E2	9.5E3	5.6E6	3.9E-1	3.7E-5	1
22C	benzo (b) fluoranthene	3.8E2	4.2E-1	2.5E2	7.7E-1	7.3E-5	37
23B	dihydroacridine	1.1E2	6.9E-1	4.1E2	2.2E-1	2.1E-5	35
25A	thiophene	1.9E3	4.2E-1	2.5E2	3.9E0	3.7E-4	37
27	lithium	1.3E2	5.9E0	3.5E3	2.6E-1	2.5E-5	27
28	sodium	2.1E4	4.0E-1	2.4E2	4.3E1	4.1E-3	39
29	potassium	>3.3E3	1.7E0	1.0E3	6.7E0	6.4E-4	24
30	rubidium	<9.0E0	7.5E-5	4.4E-2	1.8E-2	1.7E-6	77
31	cesium	2.3E1	2.7E-4	1.6E-1	4.7E-2	4.4E-6	66
32	beryllium	2.6E0	1.3E0	7.7E2	5.3E-3	5.0E-7	27
33	magnesium	3.9E4	6.5E0	3.8E3	7.9E1	7.5E-3	18
33	rhenium	<3.0E-1	(5.0E-5)	(3.0E-2)	6.1E-4	5.8E-8	80

$\sum DS$ = _____

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

Table 4-2. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
34	calcium	1.5E5	9.4E0	5.5E3	3.1E2	2.9E-2	15
35	strontium	3.9E3	1.3E0	7.7E2	7.9E0	7.5E-4	27
36	barium	7.6E3	1.5E1	8.9E3	1.5E1	1.5E-3	12
37	boron	>5.6E2	1.8E-1	1.1E2	1.1E0	1.1E-4	42
38	aluminum	2.7E4	5.2E0	3.1E3	5.5E1	5.2E-3	20
39	gallium	3.6E1	7.2E-3	4.2E0	7.3E-2	7.0E-6	54
41	thallium	3.2E0	3.2E-2	1.9E1	6.5E-3	6.2E-7	46
43	silicon	>7.0E3	7.0E-1	4.1E2	1.4E1	1.4E-3	34
44	germanium	7.2E0	1.3E-2	7.7E0	1.5E-2	1.4E-6	52
45	tin	1.4E0	(1.3E-4)	(7.7E-2)	2.8E-3	2.7E-7	69
46	lead	1.6E2	1.1E0	6.5E2	3.3E-1	3.1E-5	31
48	phosphorus	>3.3E3	3.3E1	1.9E4	6.7E0	6.4E-4	9
49	arsenic	>3.9E2	2.0E2	1.2E5	7.9E-1	7.5E-5	3
50	antimony	<4.0E2	8.0E-1	4.7E2	8.1E-1	7.7E-5	33
51	bismuth	2.6E0	6.3E-3	3.7E0	5.3E-3	5.0E-7	55
53	sulfur	>4.3E3	(3.3E-1)	(1.9E2)	8.8E0	8.3E-4	46
54	selenium	1.5E4	7.5E1	4.4E4	3.1E1	2.9E-3	6
55	tellurium	9.7E-1	9.7E-3	5.7E0	2.0E-3	1.9E-7	53

$\sum DS$ = _____

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

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Table 4-2. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
56	fluorine	1.3E3	5.2E-1	3.1E2	2.6E0	2.5E-4	36
57	chlorine	>3.2E3	(1.3E0)	7.7E2	6.5E0	6.2E-4	27
58	bromine	1.3E2	(1.9E-2)	(1.1E1)	2.6E-1	2.5E-5	49
59	iodine	<4.0E0	(5.7E-4)	(3.4E-1)	8.1E-3	7.7E-7	63
60	scandium	1.9E1	3.6E-4	2.1E-1	3.9E-2	3.7E-6	64
61	yttrium	3.0E1	3.0E-2	1.8E1	6.1E-2	5.8E-6	47
62	titanium	9.6E2	1.6E-1	9.4E1	2.0E0	1.9E-4	43
63	zirconium	8.7E1	1.7E-2	1.0E1	1.8E-1	1.7E-5	50
64	hafnium	2.9E0	5.8E-3	3.4E0	5.9E-3	5.6E-7	56
65	vanadium	3.7E1	7.4E-2	4.4E1	7.5E-2	7.2E-6	45
66	niobium	1.3E1	5.9E-4	3.5E-1	2.6E-2	2.5E-6	62
68	chromium	1.0E2	1.0E2	5.9E4	2.0E-1	1.9E-5	5
69	molybdenum	9.7E0	1.9E-3	1.1E0	2.0E-2	1.9E-6	58
70	tungsten	3.2E0	3.2E-3	1.9E0	6.5E-3	6.2E-7	57
71	manganese	1.3E2	2.6E-2	1.5E1	2.6E-1	2.5E-5	48
72	iron	<3.3E4	3.3E1	1.9E4	6.7E1	6.4E-3	9
74	cobalt	>1.5E1	3.0E-1	1.8E2	3.1E-2	2.9E-6	41
76	nickel	1.2E2	8.0E0	4.7E3	2.4E-1	2.3E-5	17

$\sum DS$ = _____

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

Table 4-2. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
78	copper	2.8E2	1.4E0	8.3E2	5.7E-1	5.4E-5	26
79	silver	1.4E2	1.4E1	8.3E3	2.8E-1	2.7E-5	14
81	zinc	5.1E2	1.3E-1	7.7E1	1.0E0	9.9E-5	44
82	cadmium	2.7E2	2.7E1	1.6E4	5.5E-1	5.2E-5	11
83	mercury	6.5E3	1.3E2	7.7E4	1.3E1	1.3E-3	4
84	cerium	5.3E1	1.4E-3	8.3E-1	1.1E-1	1.0E-5	59
84	dysprosium	1.7E0	1.8E-4	1.1E-1	3.5E-3	3.3E-7	64
84	erbium	6.4E-1	(6.9E-5)	(4.1E-2)	1.3E-3	1.2E-7	78
84	europium	9.7E-1	(1.0E-4)	(5.9E-2)	2.0E-3	1.9E-7	74
84	gadolinium	1.9E0	(2.0E-4)	(1.2E-1)	3.9E-3	3.7E-7	67
84	holmium	9.7E-1	(1.0E-4)	(5.9E-2)	2.0E-3	1.9E-7	74
84	lanthanum	3.7E1	3.4E-4	2.0E-1	7.5E-2	7.2E-6	65
84	neodymium	9.7E0	(1.0E-3)	(5.9E-1)	2.0E-2	1.9E-6	60
84	praseodymium	6.4E0	1.3E-4	7.7E-2	1.3E-2	1.2E-6	69
84	samarium	6.4E0	1.2E-4	7.1E-2	1.3E-2	1.2E-6	71
84	terbium	6.4E-1	(6.9E-5)	(4.1E-2)	1.3E-3	1.2E-7	78
84	thulium	<3.0E-1	(3.2E-5)	(1.9E-2)	6.1E-4	5.8E-7	81
85	thorium	6.4E0	1.5E-2	8.9E0	1.3E-2	1.2E-6	51

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

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Table 4-2. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
85	uranium	7.8E0	8.7E-1	5.1E2	1.6E-2	1.5E-6	32

$$\sum DS = \frac{1.09E4\ (1.09E4)}{}$$

$$\sum WDS = \frac{}{6.43E6\ (6.43E6)\ g/s}$$

$$\sum WDS/CR = \frac{2.26E4\ (2.26E4)\ g/g}{}$$

$$\sum WDS/ER = \frac{2.14E0\ (2.14E0)\ g/J}{}$$

TABLE 4-3 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Wellman-Galusha (Ft. Snelling, MN)

Coal Type: North Dakota (Indian Head) Lignite

Stream Description: Gasifier Ash- Discharge

Stream Flow Rate: ____ Nm^3/s, ____ ℓ/s, 2.42E1 g/s

Coal Feed Rate (CR): 2.85E2 g/s (1.13E0 tph)

Product Flow Rate: * 5.8E-1 Nm^3/s (7.4E4 SCFH)

Product Heating Value: ** 5.1E6 J/Nm^3 (1.4E2 Btu/SCF)

Energy Production Rate (ER): 3.0E6 J/s (1.0E7 Btu/hr)

*Uses product density of 1.01E3 g/Nm^3 as reported for Wellman-Galusha (Glen-Gery) process.

continued

**Uses product heating value as reported for Wellman- Galusha (Glen-Gery) process.

Table 4-3. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
27	lithium	4.8E1	6.9E-1	1.7E1	4.1E1	3.9E-4	17
28	sodium	1.8E4	9.0E-1	2.2E1	1.5E4	1.5E-1	14
29	potassium	8.6E3	(1.4E0)	(3.5E1)	7.3E3	6.9E-2	12
30	rubidium	4.7E1	1.3E-4	3.2E-3	4.0E1	3.8E-4	45
31	cesium	8.0E0	3.2E-5	7.7E-4	6.8E0	6.5E-5	50
32	beryllium	9.0E0	5.3E0	1.3E2	7.6E0	7.3E-5	7
33	magnesium	1.3E4	7.2E-1	1.7E1	1.1E4	1.0E-1	16
34	calcium	4.8E4	1.0E0	2.4E1	4.1E4	3.9E-1	13
35	strontium	1.9E3	2.1E-1	5.0E1	1.6E3	1.5E-2	20
36	barium	5.5E3	5.5E0	1.3E2	4.7E3	4.4E-2	5
37	boron	2.1E2	2.3E-2	5.5E-1	1.8E2	1.7E-2	30
38	aluminum	8.8E4	5.5E-0	1.3E2	7.5E4	7.1E-1	5
39	gallium	9.0E0	6.0E-4	1.5E-2	7.6E0	7.3E-5	39

$\sum$DS = _____

$\sum$WDS = _____

$\sum$WDS/CR = _____

$\sum$WDS/ER = _____

Table 4-3. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
43	silicon	1.4E5	4.7E0	1.1E2	1.2E5	1.1E0	8
44	germanium	1.0E0	5.9E-4	1.4E-2	8.5E-1	8.1E-6	40
45	tin	5.0E-1	8.3E-5	2.0E-3	4.2E-1	4.0E-6	48
46	lead	5.0E0	1.0E-1	2.4E0	4.2E0	4.0E-5	25
48	phosphorus	2.0E3	6.7E-1	1.6E1	1.7E3	1.6E-2	32
49	arsenic	3.0E1	7.5E1	1.8E3	2.5E1	2.4E-4	3
50	antimony	<4.0E-1	2.0E-1	4.8E0	3.4E-1	3.2E-6	21
53	sulfur	8.8E3	(2.2E-1)	(5.3E0)	7.5E3	7.1E-2	19
54	selenium	1.5E1	1.5E0	3.6E1	1.3E1	1.2E-4	10
56	fluorine	1.9E2	2.5E-2	6.1E-1	1.6E2	1.5E-3	29
57	chlorine	1.5E2	5.8E-4	1.4E-2	1.3E2	1.2E-3	41
58	bromine	2.0E0	(7.7E-6)	(1.9E-4)	1.7E0	1.6E-5	51
59	iodine	2.0E-1	(7.7E-7)	(1.9E-4)	1.7E-1	1.6E-6	52

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

Table 4-3. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
60	scandium	2.0E1	1.3E-4	3.0E-3	1.7E1	1.6E-4	45
61	yttrium	5.9E1	2.0E-2	4.8E-1	5.0E1	4.8E-4	31
62	titanium	4.5E3	2.5E-1	6.1E0	3.8E3	3.6E-2	18
63	zirconium	1.8E2	1.2E-1	2.9E0	1.5E2	1.5E-3	24
64	hafnium	1.0E0	6.7E-3	1.6E-1	8.5E-1	8.1E-6	32
65	vanadium	4.1E2	8.2E-1	2.0E1	3.5E2	3.3E-3	15
66	niobium	3.1E1	4.8E-4	1.2E-2	2.6E1	2.5E-4	42
68	chromium	1.0E2	6.3E2	1.5E4	8.5E1	8.1E-4	1
69	molybdenum	1.5E1	1.0E-3	2.4E-2	1.3E1	1.2E-4	36
70	tungsten	1.0E0	3.3E-4	8.1E-3	8.5E-1	8.1E-6	43
71	manganese	2.2E2	4.4E0	1.1E2	1.9E2	1.8E-3	9
72	iron	9.0E4	3.0E2	7.3E3	7.6E4	7.3E-1	2
74	cobalt	2.3E1	1.5E-1	3.7E0	2.0E1	1.9E-4	23

$\sum DS$ = _____

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

Table 4-3. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
76	nickel	7.5E1	1.5E0	3.6E1	6.4E1	6.0E-4	10
78	copper	8.1E1	8.1E-2	2.0E0	6.9E1	6.5E-4	26
79	silver	6.0E-1	6.0E-2	1.5E0	5.1E-1	4.8E-6	28
81	zinc	2.0E1	4.0E-3	9.7E-2	1.7E1	1.6E-4	34
82	cadmium	8.0E-1	8.0E-2	1.9E0	6.8E-1	6.5E-6	27
83	mercury	1.7E0	8.5E0	2.1E2	1.4E0	1.4E-5	4
84	cerium	1.1E2	1.0E-3	2.4E-2	9.3E1	8.9E-4	36
84	lanthanum	1.1E2	3.2E-4	7.8E-3	9.3E1	8.9E-4	44
84	neodymium	3.0E1	(6.5E-4)	(1.6E-2)	2.5E1	2.4E-4	38
84	praseodymium	1.6E1	1.1E-4	2.6E-3	1.4E1	1.3E-4	47
84	samarium	1.3E1	8.1E-5	2.0E-3	1.1E1	1.0E-4	49
85	thorium	2.3E1	1.8E-1	4.3E0	2.0E1	1.9E-4	22
85	uranium	1.6E1	1.3E-3	3.2E-2	1.4E1	1.3E-4	35

$\sum DS$ = 1.05E3 (1.05E3)

$\sum WDS$ = 2.53E4 (2.53E4) g/s

$\sum WDS/CR$ = 8.87E1 (8.87E1) g/g

$\sum WDS/ER$ = 8.43E-3 (8.43E-3) g/J

TABLE 4-4 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Wellman - Galusha (Ft. Snelling, MN)

Coal Type: North Dakota (Indian Head) Lignite

Stream Description: Cyclone Dust- Discharge

Stream Flow Rate: _____ Nm^3/s, _____ ℓ/s, 3.8E0 g/s

Coal Feed Rate (CR): 2.85E2 g/s (1.13E0 tph)

Product Flow Rate:* 5.8E-1 Nm^3/s (7.4E4 SCFH)

Product Heating Value:** 5.1E6 J/Nm^3 (1.4E2 Btu/SCF)

Energy Production Rate (ER): 3.0E6 J/s (1.0E7 Btu/hr)

*Uses product density of 1.01E3 g/Nm^3 as reported for Wellman - Galusha (Glen-Gery) process.

**Uses product heating value as reported for Wellman-Galusha (Glen-Gery) process.

continued

Table 4-4. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
27	lithium	6.0E0	8.6E-2	3.3E-1	8.0E-2	7.6E-6	20
28	sodium	1.1E4	5.5E-1	2.1E0	1.5E2	1.4E-2	10
29	potassium	1.3E3	(2.2E-1)	(8.2E-1)	1.7E1	1.6E-3	14
30	rubidium	3.0E0	8.3E-6	3.2E-5	4.0E-2	3.8E-6	52
31	cesium	7.0E-1	2.8E-6	1.1E-5	9.3E-3	8.9E-7	53
32	beryllium	4.0E-1	2.4E-1	8.9E-1	5.3E-4	5.1E-8	13
33	magnesium	7.8E3	2.6E-2	9.9E-2	1.0E1	9.9E-4	27
34	calcium	2.9E4	6.0E-1	2.3E0	3.9E2	3.7E-2	8
35	strontium	1.4E3	1.5E-1	5.8E-1	1.9E1	1.8E-3	19
36	barium	1.3E3	1.3E0	4.9E0	1.7E1	1.6E-3	6
37	boron	1.1E2	1.2E-2	4.5E-2	1.5E0	1.4E-4	31
38	aluminum	1.2E4	7.5E-1	2.9E0	1.6E2	1.5E-2	7
39	gallium	3.3E1	2.2E-3	8.4E-3	4.4E-1	4.2E-5	36

$\sum$DS = _____ $\sum$WDS/CR = _____

$\sum$WDS = _____ $\sum$WDS/ER = _____

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Table 4-4. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
41	thallium	9.0E-1	3.0E-3	1.1E-2	1.2E-2	1.1E-6	34
43	silicon	1.8E4	6.0E-1	2.3E0	2.4E2	2.3E-2	8
44	germanium	6.0E0	3.5E-3	1.3E-2	8.0E-2	7.6E-6	33
45	tin	2.0E0	3.3E-4	1.3E-3	2.7E-2	2.5E-6	31
46	lead	8.0E0	1.6E-1	6.1E-1	1.1E-1	1.0E-5	18
48	phosphorus	5.9E2	2.0E-1	7.5E-1	7.9E0	7.5E-4	15
49	arsenic	6.3E1	1.6E2	6.0E2	8.4E-1	8.0E-5	2
50	antimony	<4.0E-1	2.7E-3	1.0E-2	5.3E-3	5.1E-7	35
51	bismuth	3.0E-1	2.5E-4	9.5E-4	4.0E-3	3.8E-7	39
53	sulfur	1.1E4	(2.8E-1)	1.0E0	1.5E2	1.4E-2	12
54	selenium	1.4E1	1.4E0	5.3E0	1.9E-1	1.8E-5	5
55	tellurium	2.0E-1	6.7E-4	2.5E-3	2.7E-3	2.5E-7	37
56	fluorine	2.8E2	3.7E-2	1.4E-1	3.7E0	3.5E-4	23

$\sum DS$ = _____

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

Table 4-4. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
57	chlorine	5.7E-1	2.2E-6	8.3E-6	7.6E-3	7.2E-7	54
58	bromine	9.0E0	(3.5E-5)	(1.3E-4)	1.2E-1	1.1E-5	46
59	iodine	4.0E-1	(1.5E-6)	(5.8E-6)	5.3E-3	5.1E-7	55
60	scandium	5.0E0	3.1E-5	1.2E-4	6.7E-2	6.3E-6	47
61	yttrium	1.3E1	4.3 E-3	1.6E-2	1.7E-1	1.6E-5	32
62	titanium	4.0E2	2.2E-2	8.4E-2	5.3E0	5.1E-4	28
63	zirconium	2.9E1	1.9E-2	7.3E-2	3.9E-1	3.7E-5	29
65	vanadium	1.9E1	3.8E-2	1.4E-1	2.5E-1	2.4E-5	22
66	niobium	5.0E0	7.7E-5	2.9E-4	6.7E-2	6.3E-6	43
68	chromium	1.1E1	6.9E1	2.6E2	1.5E-1	1.4E-5	1
69	molybdenum	2.0E0	1.3E-4	5.1E-4	2.7E-2	2.5E-6	42
70	tungsten	<7.0E-1	2.3E-4	8.9E-4	9.3E-3	8.9E-7	40
71	manganese	1.9E1	3.8E-1	1.4E0	2.5E-1	2.4E-5	12

$\sum$OS = _____ $\sum$WDS/CR = _____

$\sum$WDS = _____ $\sum$WDS/ER = _____

Table 4-4. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
72	iron	9.2E3	3.1E1	1.2E2	1.2E2	1.2E-2	3
74	cobalt	5.0E0	3.3E-2	1.3E-1	6.7E-2	6.3E-6	24
76	nickel	4.0E0	8.0E-2	3.0E-1	5.3E-2	5.1E-6	21
78	copper	3.0E1	3.0E-2	1.1E-1	4.0E-1	3.8E-5	26
79	silver	2.0E0	2.0E-1	7.6E-1	2.7E-2	2.5E-6	15
81	zinc	1.6E2	3.2E-2	1.2E-1	2.1E0	2.0E-4	25
82	cadmium	2.0E0	2.0E-1	7.6E-1	2.7E-2	2.5E-6	17
83	mercury	<2.3E0	1.2E1	4.4E1	3.1E-2	2.9E-6	4
84	cerium	1.5E1	1.4E-4	5.2E-4	2.0E-1	1.9E-5	41
84	dysprosium	6.0E-1	1.3E-5	5.0E-5	8.0E-3	7.6E-7	49
84	lanthanum	8.0E0	2.4E-5	8.9E-5	1.1E-1	1.0E-5	48
84	neodymium	3.0E0	(6.5E-5)	(2.5E-4)	4.0E-2	3.8E-6	45
84	praseodymium	2.0E0	1.3E-5	5.1E-5	2.7E-2	2.5E-6	49

$\sum$DS = _____

$\sum$WDS = _____

$\sum$WDS/CR = _____

$\sum$WDS/ER = _____

Table 4-4. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
84	samarium	2.0E0	1.3E-5	4.8E-5	2.7E-2	2.5E-6	49
85	thorium	2.0E0	1.5E-2	5.9E-2	2.7E-2	2.5E-6	30
85	uranium	9.0E-1	7.5E-5	2.9E-4	1.2E-2	1.1E-6	44

$\sum$OS = 2.75E2 (2.74E2)

$\sum$WDS = 1.04E3 (1.03E3) g/s

$\sum$WDS/CR = 3.60E0 (3.59E0) g/g

$\sum$WDS/ER = 3.48E-4 (3.47E-4) g/J

TABLE 4-5. ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Wellman-Galusha (Ft. Snelling, MN)

Coal Type: North Dakota (Indian Head) Lignite

Stream Description: Ash Sluice Water-Discharge

Stream Flow Rate:*** ——— Nm^3/s, 7.0E-3 ℓ/s, 7.0E0 g/s

Coal Feed Rate (CR): 2.85E2 g/s (1.13E0 tph)

Product Flow Rate:* 5.8E-1 Nm^3/s (7.4E4 SCFH)

Product Heating Value:** 5.1E6 J/Nm^3 (1.4E2 Btu/SCF)

Energy Production Rate (ER): 3.0E6 J/s (1.0E7 Btu/hr)

continued

*Used product density of 1.01E3 g/Nm^3 as reported for Wellman-Galusha (Glen-Gery) process.
**Uses product heating value as reported for Wellman-Galusha (Glen-Gery) process.
***Assumes a density of 1.0 E3 g/ℓ for Ash Sluice Water.

Table 4-5. Continued

MEG Category	Chemical Name	Concentration (µg/l)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
18A	phenol	3.6E2	2.1E2	1.5E-1	8.8E-3	8.4E-7	29
27	lithium	4.0E2	1.2E0	8.4E0	9.8E-3	9.3E-7	9
28	sodium	1.7E6	1.7E2	1.2E3	4.2E1	4.0E-3	1
29	potassium	1.0E4	3.3E-1	2.3E0	2.5E-1	2.3E-5	13
30	rubidium	4.0E1	2.2E-5	1.6E-4	9.8E-4	9.3E-8	45
33	magnesium	1.1E4	1.2E-1	8.4E-1	2.7E-1	2.6E-5	15
34	calcium	2.2E5	9.2E-1	6.4E0	5.4E0	5.1E-4	10
35	strontium	4.0E3	8.7E-2	6.1E-1	9.8E-2	9.3E-6	18
36	barium	1.3E2	2.6E-2	1.8E-1	3.2E-3	3.0E-7	26
37	boron	4.6E3	9.8E-2	6.9E-1	1.1E-1	1.1E-5	17
38	aluminum	1.1E4	1.4E-1	9.8E-1	2.7E-1	2.6E-5	14
39	gallium	8.0E0	1.1E-4	7.7E-4	2.0E-4	1.9E-8	43
43	silicon	3.0E2	2.0E-3	1.4E-2	7.4E-3	7.0E-7	38

$\sum$DS = _____

$\sum$WDS = _____

$\sum$WDS/CR = _____

$\sum$WDS/ER = _____

Table 4-5. Continued

MEG Category	Chemical Name	Concentration (µg/l)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
45	tin	3.0E3	1.0E-1	7.0E-1	7.4E-2	7.0E-6	16
46	lead	8.0E0	3.2E-2	2.2E-1	2.0E-4	1.9E-8	23
47	ammonia	5.4E3	2.2E0	1.5E-1	1.3E-1	1.3E-5	5
47	cyanide	<2.0E1	4.0E-3	1.4E-1	4.9E-4	4.7E-8	34
47	nitrate	3.0E3	(2.1E-2)	(1.5E-1)	7.4E-2	7.0E-6	29
47	nitrite	<1.0E1	(7.1E-5)	(5.0E-4)	2.5E-4	2.3E-8	44
48	phosphorus	4.0E2	2.7E-2	1.9E-1	9.8E-3	9.3E-7	25
48	phosphate	1.0E2	(6.7E-3)	(4.7E-2)	2.5E-3	2.3E-7	33
49	arsenic	3.3E0	1.7E0	1.2E1	8.1E-5	7.7E-9	7
50	antimony	2.0E0	2.8E-3	2.0E-2	4.9E-5	4.7E-9	36
53	sulfur	9.7E5	(4.9E0)	(3.4E-1)	2.4E1	2.3E-3	3
53	sulfate	2.8E6	2.2E0	1.5E1	7.0E1	6.7E-3	5
53	sulfite	4.7E4	(3.1E0)	(2.2E-1)	1.2E0	1.1E-4	4

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

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Table 4-5. Continued

MEG Category	Chemical Name	Concentration (µg/l)	Discharge Severity	Weighted Discharge Severity	Production Factors µg/g coal	Production Factors µg/J Product	Discharge Severity Ranking
54	selenium	2.0E1	4.0E-1	2.8E0	4.9E-4	4.7E-8	12
56	fluoride	8.7E2	2.3E-2	1.6E-1	2.1E-2	2.0E-6	27
56	fluorine	8.7E2	2.3E-2	1.6E-1	2.1E-2	2.0E-6	27
57	chloride	7.8E4	6.0E-2	4.2E-1	1.9E0	1.8E-4	20
57	chlorine	7.8E4	6.0E-2	4.2E-1	1.9E0	1.8E-4	20
58	bromine	2.0E1	(1.5E-5)	(1.1E-3)	4.9E-4	4.7E-8	46
62	titanium	4.4E1	4.9E-4	3.4E-2	1.1E-3	1.0E-7	41
65	vanadium	7.7E1	3.1E-2	2.2E-1	1.9E-3	1.8E-7	24
66	niobium	2.0E0	6.1E-6	4.3E-5	4.9E-5	4.7E-9	47
68	chromium	7.0E0	8.8E0	6.2E1	1.7E-4	1.6E-8	2
69	molybdenum	3.1E2	4.1E-4	2.9E-3	7.6E-3	7.2E-7	42
70	tungsten	2.0E1	1.3E-3	9.1E-3	4.9E-4	4.7E-8	40
71	manganese	2.0E0	8.0E-3	5.6E-2	4.9E-5	4.7E-9	32

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

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Table 4-5. Continued

MEG Category	Chemical Name	Concentration (µg/ℓ)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
72	iron	1.2E3	8.0E-1	5.6E-0	2.9E-2	2.8E-6	11
74	cobalt	<2.0E0	2.7E-3	1.9E-2	4.9E-5	4.7E-9	37
76	nickel	2.0E1	8.0E-2	5.6E-1	4.9E-4	4.7E-8	19
78	copper	1.7E1	3.4E-3	2.4E-2	4.2E-4	4.0E-8	35
79	silver	1.0E0	2.0E-2	1.4E-1	2.5E-5	2.3E-9	31
81	zinc	4.4E1	1.8E-3	1.3E-2	1.1E-3	1.0E-7	39
82	cadmium	<2.0E0	4.0E-2	2.8E-1	4.9E-5	4.7E-9	22
83	mercury	1.4E0	1.4E0	9.8E0	3.4E-5	3.3E-9	8
84	cerium	2.0E0	3.6E-6	2.5E-5	4.9E-5	4.7E-9	48
84	lanthanum	<1.0E0	5.9E-7	4.1E-6	2.5E-5	2.3E-9	50
84	praseodymium	1.0E0	1.3E-6	9.1E-6	2.5E-5	2.3E-9	49

$\sum$DS = 1.98E2 (1.93E2)

$\sum$WDS = 1.39E3 (1.35E3) g/s

$\sum$WDS/CR = 4.87E0 (4.75E0) g/g

$\sum$WDS/ER = 4.63E-4 (4.51E-4) g/J

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TABLE 4-6 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Wellman-Galusha (Ft. Snelling, MN)

Coal Type: North Dakota (Indian Head) Lignite

Stream Description: Cyclone Quench Water- Discharge

Stream Flow Rate:*** N m^3/s, 7.0E-3 ℓ/s, 7.0E0 g/s

Coal Feed Rate (CR): 2.85E2 g/s (1.13E0 tph)

Product Flow Rate:* 5.8E-1 Nm^3/s (7.4E4 SCFH)

Product Heating Value:** 5.1E6 J/Nm^3 (1.4E2 Btu/SCF)

Energy Production Rate (ER): 3.0E6 J/s (1.0E7 Btu/hr)

continued

*Uses product density of 1.01E3 g/Nm^3 as reported for Wellman-Galusha (Glen-Gery) process.

**Used product heating value as reported for Wellman-Galusha (Glen-Gery) process.

***Assumes a density of 1.0E3 g/ℓ for Cyclone Quench Water.

Table 4-6. Continued

MEG Category	Chemical Name	Concentration (µg/l)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
18A	phenol	9.8E3	5.8E-1	4.1E0	2.4E-1	2.3E-5	5
27	lithium	4.0E1	1.2E-1	8.5E-1	9.8E-4	9.3E-8	13
28	sodium	2.2E5	2.2E1	1.5E2	5.4E0	5.1E-4	2
29	potassium	>1.0E4	3.3E-1	2.3E0	2.5E-1	2.3E-5	10
30	rubidium	2.0E1	1.1E-5	7.8E-5	4.9E-4	4.7E-8	47
31	cesium	4.0E0	3.3E-6	2.3E-5	9.8E-5	9.3E-9	50
33	magnesium	1.1E4	1.2E-1	8.6E-1	2.7E-1	2.6E-5	13
34	calcium	5.4E4	2.3E-1	1.6E0	1.3E0	1.3E-4	11
35	strontium	1.1E3	2.4E-2	1.7E-1	2.7E-2	2.6E-6	27
36	barium	5.7E2	1.1E-1	8.0E-1	1.4E-2	1.3E-6	17
37	boron	9.9E2	2.1E-2	1.5E-0	2.4E-2	2.3E-6	28
38	aluminum	1.1E4	1.4E-1	9.6E-1	2.7E-1	2.6E-5	12
39	gallium	2.0E1	2.7E-4	1.9E-3	4.9E-4	4.7E-8	41
43	silicon	2.0E3	1.3E-2	9.3E-2	4.9E-2	4.7E-6	29

$\sum$DS = _____

$\sum$WDS = _____

$\sum$WDS/CR = _____

$\sum$WDS/ER = _____

Table 4-6. Continued

MEG Category	Chemical Name	Concentration (µg/l)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
44	germanium	7.0E0	8.3E-4	5.8E-3	1.7E-4	1.6E-8	39
45	tin	2.9E3	9.7E-2	6.8E-1	7.1E-2	6.8E-6	19
46	lead	9.9E1	4.0E-1	2.8E0	2.4E-3	2.3E-7	6
47	ammonia	9.7E2	3.9E-1	2.7E-0	? 4E-2	2.3E-6	8
47	cyanide	3.6E2	3.6E-1	2.5E0	8.8E-3	8.4E-7	9
47	nitrate	<5.0E2	(3.6E-3)	(2.5E-2)	1.2E-2	1.2E-6	35
47	nitrite	<1.0E1	(7.1E-5)	(5.0E-4)	2.5E-4	2.3E-8	44
48	phosphorus	4.0E2	2.7E-2	1.9E-1	9.8E-3	9.3E-7	24
48	phosphate	1.0E2	(6.7E-3)	(4.7E-2)	2.5E-3	2.3E-7	32
49	arsenic	1.2E2	6.0E1	4.2E2	2.9E-3	2.8E-7	1
53	sulfur	2.3E4	(1.2E-1)	(8.1E-1)	5.0E-1	5.4E-5	13
53	sulfate	5.5E2	4.2E-4)	2.9E-3	1.4E-2	1.3E-6	40
53	sulfite	1.2E2	(8.0E-3)	(5.0E-2)	2.9E-3	2.8E-7	31
54	selenium	6.0E0	1.2E-1	8.4E-1	1.5E-4	1.4E-8	13

$\sum$DS = _____ $\sum$WDS/CR = _____

$\sum$WDS = _____ $\sum$WDS/ER = _____

Table 4-6. Continued

MEG Category	Chemical Name	Concentration (µg/l)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
56	fluoride	2.0E3	5.3E-2	3.7E-1	4.9E-2	4.7E-6	21
56	fluorine	2.0E3	5.3E-2	3.7E-1	4.9E-2	4.7E-6	21
57	chloride	3.4E4	2.6E-2	1.8E-1	8.4E-1	7.9E-5	25
57	chlorine	3.4E4	2.6E-2	1.8E-1	8.4E-1	7.9E-5	25
58	bromine	4.0E1	(3.1E-5)	(2.2E-4)	9.8E-4	9.3E-8	46
59	iodine	6.0E0	(4.6E-6)	(3.2E-5)	1.5E-4	1.4E-8	48
61	yttrium	2.0E0	1.3E-4	9.3E-4	4.9E-5	4.7E-9	42
62	titanium	1.8E2	2.0E-3	1.4E-2	4.4E-3	4.2E-7	37
63	zirconium	5.0E0	8.8E-5	6.1E-4	1.2E-4	1.2E-8	43
65	vanadium	1.5E1	6.0E-3	4.2E-2	3.7E-4	3.5E-8	33
68	chromium	<5.0E0	6.3E0	4.4E1	1.2E-4	1.2E-8	3
69	molybdenum	4.0E0	5.3E-5	3.7E-4	9.8E-5	9.3E-9	45
71	manganese	<1.0E0	4.0E-3	2.8E-2	2.5E-5	2.3E-9	34
72	iron	4.9E3	3.3E0	2.3E1	1.2E-1	1.1E-5	4

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

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Table 4-6. Continued

MEG Category	Chemical Name	Concentration (µg/l)	Discharge Severity	Weighted Discharge Severity	Production Factors µg/g coal	Production Factors µg/J Product	Discharge Severity Ranking
74	cobalt	9.0E0	1.2E-2	8.4E-2	2.2E-4	2.1E-8	30
76	nickel	<2.0E1	8.0E-2	5.6E-1	4.9E-4	4.7E-8	20
78	copper	1.2E1	2.4E-3	1.7E-2	2.9E-4	2.8E-8	36
79	silver	2.0E0	4.0E-2	2.8E-1	4.9E-5	4.7E-9	23
81	zinc	3.5E1	1.4E-3	9.8E-3	8.6E-4	8.2E-8	38
82	cadmium	<5.0E0	1.0E-1	7.0E-1	1.2E-4	1.2E-8	18
83	mercury	4.0E-1	4.0E-1	2.8E0	9.8E-6	9.3E-10	6
84	cerium	2.0E0	3.6E-6	2.5E-5	4.9E-5	4.7E-9	49

$\sum DS$ = 9.51E1(9.51E1)

$\sum WDS$ = 6.66E2 (6.66E2) g/s

$\sum WDS/CR$ = 2.34E0 (2.34E0) g/g

$\sum WDS/ER$ = 2.22E-4 (2.22E-4) g/J

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TABLE 4-Z ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Wellman-Galusha (Ft. Snelling, MN)

Coal Type: North Dakota (Indian Head) Lignite

Stream Description: Service Water - Process Stream

Stream Flow Rate:*** ——— Nm^3/s, ——— ℓ/s, ——— g/s

Coal Feed Rate (CR): 2.85E2 g/s (1.13E0 tph)

Product Flow Rate:* 5.8E-1 Nm^3/s (7.4E4 SCFH)

Product Heating Value:** 5.1E6 J/Nm^3 (1.4E2 Btu/SCF)

Energy Production Rate (ER): 3.0E6 J/s (1.0E7 Btu/hr)

*Uses product density of 1.01E3 g/Nm^3 as reported for Wellman-Galusha (Glen-Gery) process.

**Uses product heating value as reported for Wellman-Galusha (Glen-Gery) process.

***No flow rate available.

continued

Table 4-7. Continued

MEG Category	Chemical Name	Concentration (µg/l)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
27	lithium	7.0E1	2.1E-1				5
28	sodium	7.0E3	7.0E-1				2
29	potassium	7.0E3	2.3E-1				4
30	rubidium	2.0E0	1.1E-6				30
31	cesium	2.0E0	1.7E-6				29
33	magnesium	5.0E3	5.6E-2				8
34	calcium	>1.0E4	4.2E-2				9
35	strontium	4.0E1	8.7E-4				21
36	barium	3.0E1	6.0E-3				15
37	boron	1.0E1	2.1E-4				24
38	aluminum	1.0E2	1.3E-3				20
43	silicon	9.0E2	6.0E-3				15
48	phosphorus	5.0E1	3.3E-3				18

$\sum DS$ = _____

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

Table 4-7. Continued

MEG Category	Chemical Name	Concentration (µg/l)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
49	arsenic	<1.0E0	5.0E-1				3
53	sulfur	3.0E3	(1.5E-2)				13
56	fluorine	4.0E2	1.1E-2				14
57	chlorine	2.0E2	1.5E-4				25
58	bromine	2.0E1	(1.5E-5)				27
60	scandium	<2.0E0	2.5E-6				28
62	titanium	<6.0E1	6.7E-4				23
63	zirconium	<4.0E0	7.0E-5				26
65	vanadium	2.0E0	8.0E-4				22
68	chromium	1.0E1	1.3E1				1
71	manganese	6.0E0	2.4E-2				10
72	iron	3.0E2	2.0E-1				6
74	cobalt	<4.0E0	5.3E-3				17

$\sum DS$ = _____

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

Table 4-7. Continued

MEG Category	Chemical Name	Concentration (µg/l)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
76	nickel	2.0E1	8.0E-2				7
78	copper	1.0E1	2.0E-3				19
79	silver	<1.0E0	2.0E-2				11
81	zinc	4.0E2	1.6E-2				12

$\sum DS$ = 3.40E0 (3.40E0)

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

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TABLE4-8. ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Wellman-Galusha (Ft. Snelling, MN)

Coal Type: North Dakota (Indian Head) Lignite

Stream Description: Coal Bin Vent Gas-Effluent

Stream Flow Rate: *** _____ Nm^3/s, _____ L/s, _____ g/s

Coal Feed Rate (CR): 2.85E2 g/s (1.13E0 tph)

Product Flow Rate: * 5.8E-1 Nm^3/s (7.4E4 SCFH)

Product Heating Value: ** 5.1E6 J/Nm^3 (1.4E2 Btu/SCF)

Energy Production Rate (ER): 3.0E6 J/s (1.0E7 Btu/hr)

* Uses product density of 1.01E3 g/Nm^3 as reported for Wellman-Galusha (Glen-Gery) process.

continued

** Used product heating value as reported for Wellman-Galusha (Glen-Gery) process.

*** No flow rate available.

Table 4-8. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
47	ammonia	1.6E-2	8.9E-7				5
47	hydrogen cyanide	3.9E-2	7.8E-6				4
53	sulfur	1.8E0	(1.4E-4)				1
72	iron carbonyl	3.3E-2	1.7E-5				3
76	nickel carbonyl	<1.0E-2	2.3E-5				2

$\sum DS$ = 2.19E-4 (7.87E-5)

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

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TABLE 4-9 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Wellman-Galusha (Ft. Snelling, MN) / North Dakota (Indian Head)
Coal Type: Lignite
Stream Type: Gaseous
Stream Description: Product Gas
Stream Flow Rate:** 5.9E2 g/s

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	21C	benzo (a) pyrene	10,000
2	21B	7,12 dimethylbenzene	1,000
3	49	arsenic	100
4	83	mercury	100
5	68	chromium	100
6	54	selenium	100
7	21C	dibenzo (a,b) anthracene	100
8	21B	benzo (a) anthracene	10
9	48	phosphorus	10
9	72	iron	10
11	82	cadmium	10
12	36	barium	10
12	16A	polychlorinated biphenyls (PCB)***	10
14	79	silver	10
15	34	calcium	10
16	20B	dinitrocresol	10
17	76	nickel	10
18	33	magnesium	10
19	27	lithium	10
20	38	aluminum	10
21	15A	biphenyl	10

***Probable artifact
*Based on supplemental MEG values.
**Uses product gas density of 1.01E3 g/Nm^3 as reported for Wellman-Galusha (Glen-Gery) process.

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TABLE 4-9 (continued).

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
22	21B	benzo (c) phenanthrene	1
23	15A	benzene	1
24	29	potassium	1
25	17A	dinitrotoluenes	1
26	78	copper	1
27	32	beryllium	1
27	35	strontium	1
27*	57	chloride	1
30	21B	3-methylcholanthrene	1
31	46	lead	1

*Based on supplemental MEG values

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TABLE 4-10 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Wellman-Galusha (Ft. Snelling, MN)
Coal Type: North Dakota (Indian Head) Lignite
Stream Type: Solid
Stream Description: Gasifier Ash
Stream Flow Rate: 2.42E1 g/s

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	68	chromium	1,000
2	72	iron	100
3	49	arsenic	100
4	83	mercury	10
5	36	barium	10
5	38	aluminum	10
7	32	beryllium	10
8	43	silicon	1
9	71	manganese	1
10	76	nickel	1
10	54	selsnium	1
12*	29	potassium	1
13	34	calcium	1

*Based on supplemental MEG values

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TABLE 4-11 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Wellman-Galusha (Ft. Snelling, MN)
Coal Type: North Dakota (Indian Head) Lignite
Stream Type: Solid

Stream Description: Cyclone Dust
Stream Flow Rate: 3.8E0 g/s

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	49	arsenic	100
2	68	chromium	100
3	72	iron	10
4	83	mercury	10
5	54	selenium	1
6	36	barium	1

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TABLE 4-12 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Wellman-Galusha (Ft. Snelling, MN) North Dakota (Indian Head) Stream Description: Ash Sluice Water

Coal Type: Lignite Stream Flow Rate: 7.0E0 g/s

Stream Type: Liquid

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	28	sodium	100
2	68	chromium	10
3*	53	sulfur	1
4*	53	sulfite	1
5	47	ammonia	1
5	53	sulfate	1
7	49	arsenic	1
8	83	mercury	1
9	27	lithium	1

TABLE 4-13 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Wellman-Galusha (Ft. Snelling MN) North Dakota (Indian Head) Stream Description: Cyclone Quench Water

Coal Type: Lignite Stream Flow Rate: 7.0E0 g/s

Stream Type: Liquid

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	49	arsenic	100
2	28	sodium	10
3	68	chromium	10
4	72	iron	1

* Based on supplemental MEG Values

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TABLE 4-14 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Wellman-Galusha (Ft. Snelling, MN) North Dakota (Indian Head)
Stream Description: Service Water
Coal Type: Lignite
Stream Flow Rate: **
Stream Type: Liquid

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	68	chromium	10

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TABLE 4-16 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Wellman-Galusha (Ft. Snelling, MN) North Dakota (Indian Head)
Stream Description: Coal Bin Vent
Coal Type: Lignite
Stream Flow Rate: **
Stream Type: Gaseous

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
		No Discharge Severities Exceed 1.	

**No Flow rate available

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TABLE 4-16 RANKING OF POLLUTANTS VIA DISCHARGE SEVERITY BY PHASE

Process: Wellman-Galusha (Ft. Snelling, MN)

Coal Type: North Dakota (Indian Head) Lignite

Stream Type: Solid

Ranking	MEG Category	POLLUTANT	Discharge Severity Order of Magnitude
1	68	chromium	1,000
2	72	iron	100
3	49	arsenic	100
4	83	mercury	10
5	36	barium	10
5	38	aluminum	10
7	32	beryllium	10
8	43	silicon	1
9	71	manganese	1
10	76	nickel	1
10	54	selenium	1
12*	29	potassium	1
13	34	calcium	1

*Based on supplemental MEG values

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TABLE 4-17 RANKING OF POLLUTANTS VIA DISCHARGE SEVERITY BY PHASE

Process: Wellman-Galusha (Ft. Snelling, MN)

Coal Type: North Dakota (Indian Head) lignite

Stream Type: Liquid

Ranking	MEG Category	POLLUTANT	Discharge Severity Order of Magnitude
1	28	sodium	100
2	49	arsenic	100
3	68	chromium	10
4*	53	sulfur	1
5	72	iron	1
6*	53	sulfite	1
7	47	ammonia	1
7	53	sulfate	1
9	83	mercury	1
10	27	lithium	1

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TABLE 4-18 RANKING OF POLLUTANTS VIA WEIGHTED DISCHARGE SEVERITY BY PHASE

Process: Wellman-Galusha (Ft. Snelling, MN)

Coal Type: North Dakota (Indian Head) Lignite

Stream Type: Gaseous

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	21C	benzo (a) pyrene	10,000
2	21B	7,12 dimethylbenzene	1,000
3	49	arsenic	100
4	83	mercury	100
5	68	chromium	100
6	54	selenium	100
7	21C	dibenzo (a,b) anthracene	100
8	21B	benzo (a) anthracene	10
9	48	phosphorus	10
9	72	iron	10
11	82	cadmium	10
12	36	barium	10
12	16A	polychlorinated biphenyls (PCB)	10
14	79	silver	10
15	34	calcium	10
16	20B	dinitrocresol	10
17	76	nickel	10
18	33	magnesium	10
19	27	lithium	10
20	38	aluminum	10
21	15A	biphenyl	10

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TABLE 4-10 (continued).

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
22	21B	benzo (c) phenanthrene	1
23	15A	benzene	1
24	29	potassium	1
25	17A	dinitrotoluenes	1
26	78	copper	1
27	32	beryllium	1
27	35	strontium	1
29	21B	3-methylcholanthrene	1
30	46	lead	1

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TABLE 4-19 RANKING OF POLLUTANTS VIA WEIGHTED DISCHARGE SEVERITY BY PHASE

Process: Wellman-Galusha (Ft. Snelling, MN)

Coal Type: North Dakota (Indian Head) Lignite

Stream Type: Solid

Ranking	MEG Category	Pollutant	WDS/Btu Coal Input
1	68	chromium	1.6E-3 g/J
2	72	iron	1.4E-3
3	49	arsenic	1.9E-4
4	36	barium	2.5E-5
5	38	aluminum	2.5E-5
6	83	mercury	2.2E-5
7	43	silicon	2.2E-5
8	71	manganese	2.0E-5
9	32	beryllium	1.3E-5
10	76	nickel	7.9E-6
11	54	selenium	6.9E-6
12*	29	potassium	6.4E-6
13	34	calcium	4.6E-6

*Based on supplemental MEG values

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TABLE 4-20 RANKING OF POLLUTANTS VIA WEIGHTED DISCHARGE SEVERITY BY PHASE

Process: Wellman-Galusha (Ft. Snelling, MN)

Coal Type: North Dakota (Indian Head) Lignite

Stream Type: Liquid

Ranking	MEG Category	Pollutant	WDS/Coal Input
1	28	sodium	2.3E-4 g/J
2	49	arsenic	8.0E-5
3	68	chromium	1.2E-5
4*	53	sulfur	6.5E-6
5	72	iron	4.4E-6
6*	53	sulfite	4.2E-6
7	47	ammonia	2.9E-6
7	53	sulfate	2.9E-6
9	83	mercury	1.9E-6
10	27	lithium	1.6E-6

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TABLE 4-21 RANKING OF POLLUTANTS VIA WEIGHTED DISCHARGE SEVERITY BY PHASE

Process: Wellman-Galusha (Ft. Snelling, MN)

Coal Type: North Dakota (Indian Head) Lignite

Stream Type: Gaseous

Ranking	MEG Category	Pollutant	WDS/Coal Input
1	21C	benzo (a) pyrene	1.1E0 g/J
2	21B	7, 12 dimethylbenzene	7.0E-2
3	49	arsenic	2.3E-2
4	83	mercury	1.5E-2
5	68	chromium	1.1E-2
6	54	selenium	8.5E-3
7	21C	dibenzo (a,b) anthracene	7.4E-3
8	21B	benzo (a) anthracene	4.5E-3
9	48	phosphorus	3.7E-3
9	72	iron	3.7E-3
11	82	cadmium	3.0E-3
12	36	barium	1.7E-3
12	16A	polychlorinated biphenyls (PCB)*	1.7E-3
14	79	silver	1.6E-3
15	34	calcium	1.1E-3
16	20B	dinitrocresol	1.0E-3
17	76	nickel	9.0E-4
18	33	magnesium	7.3E-4
19	27	lithium	6.7E-4
20	38	aluminum	5.9E-4
21	15A	biphenyl	5.8E-4

* Probable artifact

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TABLE 4-27 (continued).

Ranking	MEG Category	Pollutant	WDS/Coal Input
22	21B	benzo (c) phenanthrene	5.1E-4
23	15A	benzene	4.9E-4
24	29	potassium	1.9E-4
25	17A	dinitrotoluenes	1.7E-4
26	78	copper	1.6E-4
27	32	beryllium	1.5E-4
27	35	strontium	1.5E-4
29	21B	3-methylcholanthrene	1.4E-4
30	46	lead	1.2E-4

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TABLE5-1. SUMMARY DISCHARGE SEVERITY MEASURES FOR SYNTHETIC FUEL PROCESSES

Process: Chapman Gasifier — Product Flow Rate: 9.52E-1 Nm^3/s (1.21E5 SCF/hr)

Coal Type: Presized Va. Low-sulfur Bituminous — Product Heating Value: 4.99E6 J/Nm^3 (1.34E2 Btu/SCF)

Coal Rate (CR): 3.04E2 g/s (1.21E0 T/hr) — Energy Production Rate (ER): 4.75E6 J/s (1.67E7 Btu/hr)

Stream	Stream Flow Rate	$\sum$ DS	$\sum$ WDS	$\sum$ WDS/CR	$\sum$ WDS/ER	No. Compounds Identified	No. Compounds with DS≥1
Coal Feeder Vent Gas	6.11E0 g/s	5.02E5	3.07E6 g/s	1.01E4 g/g	6.46E-1 g/J	117	40
Separator Liquor	*	2.27E5	*	*	*	71	15
By-Product Tar	3.04E1g/s	1.57E4	2.03E6 g/s	6.67E3 g/g	4.27E-1 g/J	100	26
Separator Vent	5.39E1 g/s	1.76E3	9.49E4 g/s	3.12E2 g/g	2.00E-2 g/J	108	41
Cyclone Dust	1.61E0 g/s	2.75E2	4.42E2 g/s	1.45E0 g/g	9.31E-5 g/J	33	8
Gasifier Ash	1.85E1 g/s	2.42E2	4.48E3 g/s	1.47E1 g/g	9.43E-4 g/J	41	12

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TABLE 5-2. ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Chapman Gasifier

Coal Type: Presized Va. Low-sulfur Bituminous

Stream Description: Coal Feeder Vent Gas-Discharge

Stream Flow Rate: 6.11E-3 Nm^3/s,* ——— ℓ/s, 6.11E0 g/s

Coal Feed Rate (CR): 3.04E2 g/s (1.21E0 tph)

Product Flow Rate: 9.52E-1 Nm^3/s (1.21E5 SCFH)

Product Heating Value: 4.99E6 J/Nm^3 (1.34E2 Btu/SCF)

Energy Production Rate (ER): 4.75E6 J/s (1.62E7 Btu/hr)

*Assumes a density of 1.00E3 g/Nm^3

continued

Table 5-2. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	> C_6 alkanes	6.4E2	(1.8E-3)	(1.1E-2)	1.3E-2	8.2E-7	110
01A	≥ C_{13} alkanes	1.0E5	(1.0E-1)	(6.1E-1)	2.0E0	1.3E-4	69
05A	> C_6 aliphatic alcohols	1.5E4	(4.2E-2)	(2.6E-1)	3.0E-1	1.9E-5	80
05A	≥ C_{13} aliphatic alcohols	3.1E3	(3.8E-2)	(2.3E-1)	6.2E-2	9.0E-6	83
08A	phthalic acid	4.3E3	2.1E-2	1.3E-1	8.6E-2	5.5E-6	91
08A	phthalic esters	6.8E4	(3.3E-1)	(2.0E0)	1.4E0	8.7E-5	53
10C	aminonaphthalene	2.0E3	3.5E0	2.1E1	4.0E-2	2.6E-6	21
10C	methylaminonaphthalene	5.4E3	(9.6E0)	(5.9E1)	1.1E-1	6.9E-6	14
15A	C_2-alkylbenzene	6.9E3	(2.3E0)	(1.4E1)	1.4E-1	8.9E-6	28
15A	C_3-alkylbenzene	3.5E3	(1.2E0)	(7.3E0)	7.0E-2	4.5E-6	35

ΣDS = _____ $\Sigma WDS/CR$ = _____

ΣWDS = _____ $\Sigma WDS/ER$ = _____

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Table 5-2. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
15A	biphenylene	1.3E4	(1.3E1)	(7.9E1)	2.6E-1	1.7E-5	10
15B	indane	1.6E3	7.1E-3	4.3E-2	3.2E-2	2.1E-6	98
15B	tetrahydro-naphthalene	3.3E3	2.5E-2	1.5E-1	6.6E-2	4.2E-6	88
18A	phenol	3.8E3	2.0E-1	1.2E0	7.6E-2	4.9E-6	60
18A	cresol	1.1E4	1.1E0	6.7E0	2.2E-1	1.4E-5	36
18A	C_2-alkylpheno	1.0E4	(5.3E-1)	(6.1E0)	2.0E-1	1.3E-5	40
18A	C_3-alkylpheno	1.7E3	(8.9E-2)	(1.0E0)	3.4E-2	2.2E-6	65
18A	C_4-alkylpheno	2.7E2	(1.4E-2)	(1.6E-1)	5.4E-3	3.5E-7	87
18C	indanol	6.4E2	4.3E-3	2.6E-2	1.3E-2	8.2E-7	101
18C	naphthol	2.4E3	2.1E-2	1.3E-2	4.8E-2	3.1E-6	91
18C	methylnaphtho	3.5E3	(3.0E-2)	(1.8E-1)	7.0E-2	4.5E-6	86
18C	C_2-alkylnaph-thol	2.7E2	(2.3E-3)	(1.4E-2)	5.4E-3	3.5E-7	108

ΣDS = _____

ΣWDS = _____

$\Sigma WDS/CR$ = _____

$\Sigma WDS/ER$ = _____

Table 5-2. Continued

MEG Category	Chemical Name	Concentration (µg/m^3)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
18C	hydroxyace-naphthylene	3.7E2	(3.2E-3)	(2.0E-2)	7.4E-3	4.8E-7	105
18C	hydroxyace-naphthene	7.3E2	(6.2E-3)	(3.8E-2)	1.5E-2	9.4E-7	99
18C	methylhydroxy-acenaphthene	2.7E3	(2.3E-2)	(1.4E-1)	5.4E-2	3.5E-6	88
18C	C_2-alkylhy-droxyacenap-thene	1.5E3	(1.3E-2)	(7.9E-2)	3.0E-2	1.9E-6	94
18C	C_3-alkylhy-droxyacenap-thene	3.7E2	(3.2E-3)	(2.0E-2)	7.4E-3	4.8E-7	105
18C	hydroxyanthra-cene	5.5E2	(4.7E-3)	(2.9E-2)	1.1E-2	7.1E-7	100
21A	naphthalene	2.4E4	4.8E-1	2.9E0	4.8E-1	3.1E-5	48
21A	methylnaphtha-lene	2.7E4	1.2E-1	7.3E-1	5.4E-1	3.5E-5	68
21A	binaphthyl	1.4E4	(8.8E0)	(5.4E1)	2.8E-1	1.8E-5	16

$\sum$DS = _____

$\sum$WDS = _____

$\sum$WDS/CR = _____

$\sum$WDS/ER = _____

Table 5-2. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
21A	methylacenaphthalene	5.3E3	(3.3E0)	(2.0E1)	1.0E-1	6.7E-6	22
21A	acenaphthylene	2.8E4	(1.8E1)	(1.1E2)	5.6E-1	3.6E-5	8
21A	methylacenaphthylene	1.3E4	(3.1E0)	(4.9E1)	2.6E-1	1.7E-5	17
21A	C_2-alkylacenaphthylene	4.1E3	(2.6E0)	(1.6E1)	8.2E-2	5.3E-6	26
21A	C_2-alkylacenaphthalene	3.3E3	(2.1E0)	(1.3E1)	6.6E-2	4.2E-6	29
21A	anthracene	1.9E4	3.4E-1	2.1E0	3.8E-1	2.4E-5	51
21A	methylanthracene	4.6E4	(8.2E-1)	(5.0E0)	9.2E-1	5.9E-5	42
21A	C_2alkylnaphthalene	1.4E4	(6.2E-2)	(3.8E-1)	2.8E-1	1.8E-5	75
21A	phenanthrene	1.9E4	1.2E1	7.3E1	3.8E-1	2.4E-5	11
21B	chrysene	7.4E3	3.3E0	2.0E1	1.5E-1	9.5E-6	22
21B	pyrene	9.2E3	4.0E-2	2.4E-1	1.8E-1	1.2E-5	81

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$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

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Table 5-2. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
21C	perylene	4.9E3	(2.5E5)	(1.5E0)	9.8E-2	6.3E-6	1
21C	benzopyrene	4.9E3	2.5E5	1.5E0	9.8E-2	6.3E-6	1
21D	benzoperylene	1.6E3	(3.7E1)	(2.3E2)	3.2E-2	2.1E-6	6
22A	indene	2.7E4	6.0E-1	3.7E0	5.4E-1	3.5E-5	45
22A	methylindene	1.3E4	(2.9E-1)	(1.8E0)	2.6E-1	1.7E-5	57
22A	fluorene	9.1E3	(2.0E-1)	(1.2E0)	1.8E-1	1.2E-5	60
22A	methylfluorene	4.1E3	(9.1E-2)	(5.6E-1)	8.2E-2	5.3E-6	73
22B	fluoranthene	9.2E3	1.0E-1	6.1E-1	1.8E-1	1.2E-5	69
23B	quinoline	4.8E3	3.0E-1	1.8E0	9.6E-2	6.2E-6	56
23B	methylquinoline	2.0E3	3.6E-2	2.2E-1	4.0E-2	2.6E-6	85
23B	C_2-alkylquinoline	5.4E3	(3.4E-1)	(2.1E0)	1.1E-1	6.9E-6	51
23B	acridine	8.4E3	9.3E-2	5.7E-1	1.7E-1	1.1E-5	72
23B	methylacridine	4.8E3	(5.3E-2)	(3.2E-1)	9.6E-2	6.2E-6	77

ΣDS = _____

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Table 5-2. Continued

MEG Category	Chemical Name	Concentration (µg/m³)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
23B	benzophenanthridine	4.8E3	(5.3E-2)	(3.2E-1)	9.6E-2	6.2E-6	77
23B	methylbenzophenanthridine	2.4E3	(1.5E1)	(9.2E1)	4.8E-2	3.1E-6	9
23C	carbazole	4.9E3	2.1E-1	1.3E0	9.8E-2	6.3E-6	59
23C	pyrroline	2.0E3	(2.0E1)	(1.2E2)	4.0E-2	2.6E-6	7
27	lithium	1.0E1	4.5E-1	2.7E0	2.0E-4	1.3E-8	49
29	potassium	1.0E4	5.0E0	3.1E1	2.0E-1	1.3E-5	20
30	rubidium	1.0E1	8.3E-5	5.1E-4	2.0E-4	1.3E-8	116
33	magnesium	9.0E1	1.5E-2	9.2E-2	1.8E-3	1.2E-7	95
34	calcium	1.0E3	6.3E-2	3.8E-1	2.0E-2	1.3E-6	74
35	strontium	1.0E1	3.3E-3	2.0E-2	2.0E-4	1.3E-8	101
36	barium	1.0E1	2.0E-2	1.2E-1	2.0E-4	1.3E-8	93
37	boron	3.0E1	9.7E-3	5.9E-2	6.0E-4	3.9E-8	97

ΣDS = _____

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Table 5-2. Continued

MEG Category	Chemical Name	Concentration (μg/m³)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					μg/g coal	μg/J Product	
38	aluminum	1.0E4	1.9E0	1.2E1	2.0E-1	1.3E-5	33
39	gallium	9.0E1	1.8E-2	1.1E-1	1.8E-3	1.2E-7	94
41	thallium	1.0E1	1.0E-1	6.1E-1	2.0E-4	1.3E-8	69
42	carbon dioxide	1.0E7	1.1E0	6.7E0	2.0E2	1.3E-2	36
42	carbon monoxide	2.0E7	5.0E2	3.1E3	4.0E2	2.6E-2	4
43	silicon	8.0E3	8.0E-1	4.9E0	1.6E-1	1.0E-5	43
45	tin	7.0E0	(6.4E-4)	(3.9E-3)	1.4E-4	9.0E-9	114
46	lead	1.0E2	6.7E-1	4.1E0	2.0E-3	1.3E-7	44
47	nitrogen oxide	1.0E4	1.1E0	6.7E0	2.0E-1	1.3E-5	36
47	ammonia	3.0E4	1.7E0	1.0E1	6.0E-1	3.9E-5	34
47	cyanide	1.0E4	5.0E-1	3.1E0	2.0E-1	1.3E-5	46
48	phosphorus	2.0E2	2.0E0	1.2E1	4.0E-3	2.6E-7	30
49	arsenic	4.0E0	2.0E0	1.2E1	8.0E-5	5.1E-9	30

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

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Table 5-2. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
50	antimony	2.0E2	4.0E-1	2.4E0	4.0E-3	2.6E-7	50
51	bismuth	1.0E0	2.4E-3	1.5E-2	2.0E-5	1.3E-9	107
53	sulfur	5.0E2	(3.8E-2)	(2.3E-1)	1.0E-2	6.4E-7	83
53	thiocyanate	1.0E5	(9.1E0)	(5.6E1)	2.0E0	1.3E-4	15
53	sulfur dioxide	4.0E3	3.1E-1	1.9E0	8.0E-2	5.1E-6	55
53	carbonyl sulfide	1.0E4	2.6E0	1.6E1	2.0E-1	1.3E-5	26
53	hydrogen sulfide	1.0E5	6.7E0	4.1E1	2.0E0	1.3E-4	18
53	carbon disulfide	2.0E4	6.7E0	4.1E1	4.0E-1	2.6E-5	18
54	selenium	1.0E1	5.0E-2	3.1E-1	2.0E-4	1.3E-8	79
56	fluorine	< 1.0E2	4.0E-2	2.4E-1	2.0E-3	1.3E-7	81
56	fluoride	9.0E0	3.6E-3	2.2E-2	1.8E-4	1.2E-8	103
57	chlorine	3.0E4	(1.2E1)	(7.3E1)	6.0E-1	3.9E-5	11

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

Table 5-2. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
57	chloride	7.0E3	(2.8E0)	(1.7E1)	1.4E-1	9.0E-6	24
58	bromine	7.0E1	(1.0E-2)	(6.1E-2)	1.4E-3	9.0E-8	95
59	iodine	1.0E0	(1.4E-4)	(8.6E-4)	2.0E-5	1.3E-9	115
60	scandium	1.0E0	1.9E-5	1.2E-4	2.0E-5	1.3E-9	117
61	yttrium	2.0E0	2.0E-3	1.2E-2	4.0E-5	2.6E-9	109
62	titanium	1.0E3	1.7E-1	1.0E0	2.0E-2	1.3E-6	65
63	zirconium	1.0E3	2.0E-1	1.2E0	2.0E-2	1.3E-6	60
65	vanadium	8.0E1	1.6E-1	9.8E-1	1.6E-3	1.0E-7	67
66	niobium	4.0E2	1.8E-2	1.1E-1	8.0E-3	5.1E-7	94
68	chromium	8.0E2	8.0E2	4.9E3	1.6E-2	1.0E-6	3
69	molybdenum	3.0E2	6.0E-2	3.7E-1	6.0E-3	3.4E-7	76
70	tungsten	4.0E0	4.0E-3	2.4E-2	8.0E-5	5.1E-9	102
71	manganese	4.0E0	8.0E-4	4.9E-4	8.0E-5	5.1E-9	113

$\sum$OS = _____

$\sum$WDS = _____

$\sum$WDS/CR = _____

$\sum$WDS/ER = _____

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MEG Category	Chemical Name	Concentration (μg/m³)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					μg/g coal	μg/J Product	
72	iron	5.0E2	5.0E-1	3.1E0	1.0E-2	6.4E-7	46
74	cobalt	1.0E1	2.0E-1	1.2E0	2.0E-4	1.3E-8	60
76	nickel	5.0E0	3.3E-1	2.0E0	1.0E-4	6.4E-9	53
78	copper	4.0E2	2.0E0	1.2E-1	8.0E-3	5.1E-7	30
79	silver	2.0E0	2.0E-1	1.2E0	4.0E-5	2.6E-9	60
81	zinc	1.0E3	2.5E-1	1.5E-0	2.0E-2	1.3E-6	56
82	cadmium	< 3.0E1	3.0E0	1.8E1	6.0E-4	3.9E-8	24
83	mercury	5.0E2	1.0E1	6.1E1	1.0E-2	6.4E-7	13
84	lanthanum	1.0E2	9.1E-4	5.6E-3	2.0E-3	1.3E-7	112
84	cerium	6.0E1	1.6E-3	9.8E-3	1.2E-3	7.7E-8	111
85	uranium	7.0E2	7.8E1	4.8E2	1.4E-2	9.0E-7	5
85	thorium	1.0E1	1.1E0	6.7E0	2.0E-4	1.3E-8	36

$\sum DS$ = 5.02E5 (2.52E5)

$\sum WDS$ = 3.07E6 (1.54E3) g/s

$\sum WDS/CR$ = 1.01E4 (5.06E3) g/g

$\sum WDS/ER$ = 6.46E-1 (3.24E-4) g/J

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TABLE 5-3 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Chapman Gasifier

Coal Type: Presized Va. Low-sulfur Bituminous

Stream Description: Separator Liquor* - process stream

Stream Flow Rate: _____ m^3/s, _____ ℓ/s, _____ g/s

Coal Feed Rate (CR): 3.04E2 g/s (1.21E0 tph)

Product Flow Rate: 9.52E-1 Nm^3/s (1.21E5 SCFH)

Product Heating Value: 4.99E6 J/Nm^3 (1.34E2 Btu/SCF)

Energy Production Rate (ER): 4.75E6 J/s (1.62E7 Btu/hr)

continued

*Separator Liquor is recycled: no stream flow rate is available

Table 5-3. Continued

MEG Category	Chemical Name	Concentration (µg/ℓ)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	$\geq C_6$ alkanes	1.0E5	(1.9E-2)				33
01A	methylcyclohexane	4.0E2	(7.5E-5)				64
03A	anisoles	1.3E6	5.4E-1				19
05B	$>C_6$ alkylalcohols	1.2E4	(5.0E-3)				45
05B	$>C_{15}$ alkylalcohols	5.4E3	(2.3E-3)				49
08A	phthalic acid	4.0E3	1.3E-3				54
08D	phthalates	2.2E4	2.9E-1				21
08D	adipates	1.9E4	(1.8E-2)				34
10C	aniline	3.0E3	1.0E-2				40
10C	aminotoluenes	3.8E3	2.3E0				12
10C	C_2-alkylaniline	1.0E3	(3.4E-3)				48

$\sum$DS = _____

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$\sum$WDS/CR = _____

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Table 5-3. Continued

MEG Category	Chemical Name	Concentration (µg/ℓ)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
18A	phenol	7.2E5	4.2E1				7
18A	C_2-alkyl-phenols	3.7E5	(7.4E4)				1
18A	C_3-alkyl-phenols	5.0E4	(1.0E4)				2
21A	naphthalene	1.7E4	2.3E-2				31
21A	methylnaph-thalene	5.1E3	1.5E-3				53
21A	acenaphthylene	4.1E3	(1.7E-1)				23
21C	benzoperylene	3.4E4	(5.2E1)				6
22A	indene	8.2E3	1.2E-2				39
22A	methylindene	3.4E3	(5.0E-3)				45
23A	methylpy-ridine	3.0E3	5.7E-3				44
23A	C_2-alkylpy-ridine	3.8E3	(1.7E-2)				35

$\sum DS$ = _____

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$\sum WDS/ER$ = _____

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Table 5-3. Continued

MEG Category	Chemical Name	Concentration (µg/ℓ)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
23A	C_3-aklypyridine	1.0E3	(4.3E-3)				47
23C	methylpyrroline	1.3E3	(8.7E-1)				15
23B	quinoline	3.1E3	1.3E-2				36
23B	methylquinoline	1.8E3	2.2E-3				50
23B	C_3-alkylquino	2.4E3	1.0E-2				40
23C	indole	5.3E4	3.1E-1				20
23C	methylindole	8.9E3	1.3E-2				36
24A	methyldioxolone	5.0E0	3.8E-8				71
27	lithium	3.0E0	9.1E-3				43
29	potassium	2.0E4	6.7E-1				17
30	rubidium	1.0E1	5.6E-6				66
31	cesium	1.0E0	8.3E-7				70

$\sum DS$ = _____

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$\sum WDS/ER$ = _____

Table 5-3. Continued

MEG Category	Chemical Name	Concentration (µg/ℓ)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
33	magnesium	2.0E3	2.2E-2				32
34	calcium	2.0E4	8.3E-2				27
35	strontium	8.0E1	1.7E-3				52
36	barium	3.0E2	6.0E-2				28
37	boron	9.0E3	1.9E-1				22
42	carbonate	2.0E6	(3.8E1)				10
43	silicon	2.0E3	1.3E-2				36
45	tin	3.0E1	1.0E-3				54
47	ammonia	5.0E6	2.0E3				3
47	cyanide (alkali)	1.0E6	1.0E3				4
48	phosphorus	2.0E4	1.3E0				14
49	arsenic	8.0E2	4.0E2				5
50	antimony	7.0E1	9.7E-2				26

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

Table 5-3. Continued

MEG Category	Chemical Name	Concentration (µg/ℓ)	Discharge Severity	Weighted Discharge Severity	Production Factors µg/g coal	Production Factors µg/J Product	Discharge Severity Ranking
53	sulfur	< 8.0E3	(4.0E-2)				30
53	thiocyanate	7.0E1	(1.4E-1)				24
53	sulfide	< 1.0E4	4.0E1				8
53	sulfate	1.0E6	7.7E-1				16
54	selenium	2.0E3	4.0E1				8
56	fluorine (as F^-)	2.0E3	5.3E-2				29
56	fluoride	2.0E5	5.3E0				11
57	chlorine (as Cl^-)	2.0E2	1.5E-4				63
57	chloride	3.0E6	2.3E0				12
58	bromine	3.0E2	(2.3E-4)				60
59	iodine	3.0E2	(2.3E-4)				60
60	scandium	2.0E0	2.5E-6				69
61	yttrium	5.0E0	3.3E-4				58

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Table 5-3. Continued

MEG Category	Chemical Name	Concentration (µg/ℓ)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
62	titanium	1.0E2	1.1E-3				55
63	zirconium	1.0E1	1.8E-4				62
66	niobium	8.0E0	2.4E-5				65
70	tungsten	1.0E1	6.7E-4				57
72	iron	1.0E3	6.7E-1				17
78	copper	1.0E1	2.0E-3				51
79	silver	2.0E0	4.0E-2				30
82	cadmium	5.0E0	1.0E-1				25
83	mercury	< 3.0E-4	3.0E-4				59
84	lanthanum	7.0E0	4.1E-6				68
84	cerium	3.0E0	5.5E-6				67

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TABLE 5-4 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Chapman Gasifier

Coal Type: Presized Va. Low-sulfur Bituminous

Stream Description: By-Product Tar (By product)

Stream Flow Rate: ____ m^3/s, ____ ℓ/s, 3.04E1 g/s

Coal Feed Rate (CR): 3.04E2 g/s (1.21E0 tph)

Product Flow Rate: 9.52E-1 Nm^3/s (1.21E5 SCFH)

Product Heating Value: 4.99E6 J/Nm^3 (1.34E2 Btu/SCF)

Energy Production Rate (ER): 4.75E6 J/s (1.62E7 Btu/hr)

continued

Table 5-4. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	$>C_6$ alkanes	4.0E2	(3.6E-4)	(1.1E-2)	4.0E1	2.6E-3	89
01A	$\geq C_{13}$ alkanes	9.0E2	(2.9E-4)	(8.8E-3)	9.0E1	5.8E-3	92
03A	anisoles	8.4E3	(1.7E-2)	(5.2E-1)	8.4E2	5.4E-2	53
05B	$>C_6$ alkyl-alcohols	3.4E3	(7.1E-3)	(2.2E-1)	3.4E2	2.2E-2	61
08A	phthalic acid	1.0E2	1.6E-4	4.9E-3	1.0E1	6.4E-4	93
08D	phthalate esters	3.0E4	2.0E0	6.1E1	3.0E3	1.9E-1	23
08D	adipate esters	2.2E4	(1.0E-1)	(3.0E0)	2.2E3	1.4E-1	46
08D	$>C_9$ aliphatic esters	4.8E3	(3.2E-1)	(9.7E0)	4.8E2	3.1E-2	40
10C	aminotetralin	9.0E2	(1.8E0)	(5.5E1)	9.0E1	5.8E-3	25
10C	C_2-alkylaniline	1.0E2	(1.8E-3)	(5.5E-2)	1.0E1	6.4E-4	85
10C	C_3-alkylaniline	2.0E2	(3.5E-3)	(1.1E-1)	2.0E1	1.3E-3	71

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Table 5-4. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
10C	benzofluoreneamine	6.0E2	(2.0E0)	(6.1E1)	6.0E1	3.8E-3	23
10C	methylbenzofluoreneamine	2.0E2	(6.7E-1)	(2.0E1)	2.0E1	1.3E-3	29
10C	aminonaphthalene	1.0E3	5.9E-1	1.8E1	1.0E2	6.3E-3	32
10C	methylaminoacenaphthylene	2.0E2	(6.7E-1)	(2.0E1)	2.0E1	1.3E-3	29
18A	phenol	1.8E3	5.3E-1	1.6E1	1.8E2	1.2E-2	34
18A	C_2-alkylphenol	5.8E3	(5.8E3)	(1.8E5)	5.8E2	3.7E-2	4
18A	C_3-alkylphenol	1.0E3	(1.0E3)	(3.0E4)	1.0E2	6.4E-3	16
18C	indanol	3.0E2	3.0E2	9.1E3	3.0E1	1.9E-3	19
18C	naphthol	1.8E3	1.8E3	5.5E4	1.8E2	1.2E-2	12
18C	methylnaphthol	2.0E3	(2.0E3)	(6.1E4)	2.0E2	1.3E-2	10
18C	C_2-alkylnaphthol	3.0E2	(3.0E2)	(9.1E3)	3.0E1	1.9E-3	19

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

Table 5-4. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
18C	acenaphthol	3.0E2	(3.0E2)	(9.1E3)	3.0E1	1.9E-3	19
18C	methyl-acenaphthol	(9.0E2)	(9.0E2)	(2.7E4)	9.0E1	5.8E-3	17
18C	C_2-alkyl-acenaphthol	1.6E3	(1.6E3)	(4.9E4)	1.6E2	1.0E-2	13
18C	C_3-alkyl-acenaphthol	7.0E2	(7.0E2)	(2.1E4)	7.0E1	4.5E-3	18
18C	hydroxyanthracene	1.5E3	(1.5E3)	(4.6E4)	1.5E2	9.6E-3	14
18C	C_5-alkyl-hydroxyanthracene	2.0E3	(2.0E3)	(6.1E4)	2.0E2	1.3E-2	10
18C	C_2-alkyl-hydroxypyrene	2.1E3	(2.1E3)	(6.4E4)	2.1E2	1.3E-2	9
18C	hydroxybenzofluorene	3.5E3	(3.5E3)	(1.1E5)	3.5E2	2.2E-2	6
21A	naphthalene	2.1E3	1.4E-2	4.3E-1	2.1E2	1.3E-2	56

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$\sum WDS$ = _____ $\sum WDS/ER$ = _____

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Table 5-4. Continued

HEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors µg/g coal	Production Factors µg/J Product	Discharge Severity Ranking
21A	methylnaphthalene	4.2E3	6.2E-3	1.9E-1	4.2E2	2.7E-2	63
21A	C_2-alkylnaphthalene	4.4E3	(6.5E-3)	(2.0E-1)	4.4E2	2.8E-2	62
21A	acenaphthene	1.4E3	(2.9E-1)	(8.8E0)	1.4E2	9.0E-3	42
21A	methylacenaphthene	6.0E2	(1.3E-1)	(4.0E0)	6.0E1	3.8E-3	45
21A	C_2-alkylacenaphthene	1.2E3	(2.5E-1)	(7.6E0)	1.2E2	7.7E-3	44
21A	C_3-alkylacenaphthene	5.0E2	(1.0E-1)	(3.0E0)	5.0E1	3.2E-3	46
21A	acenaphthylene	4.3E3	(9.0E-1)	(2.7E1)	4.3E2	3.8E-2	27
21A	methylacenaphthylene	2.8E3	(5.8E-1)	(1.8E1)	2.8E2	1.8E-2	33

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ΣWDS = _____ $\Sigma WDS/ER$ = _____

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EPA-287 (Cin.)
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Table 5-4. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
21A	C_2-alkyl-acenaphthylene	1.4E3	(2.9E-1)	(8.8E0)	1.4E2	9.0E-3	42
21A	anthracene	6.3E3	3.7E-2	1.1E0	6.3E2	4.0E-2	51
21A	methylanthracene	2.1E3	(1.2E-2)	(3.6E-1)	2.1E2	1.3E-2	58
21A	C_2-alkylanthracene	8.0E2	(4.7E-3)	(1.4E-1)	8.0E1	5.1E-3	67
21B	methylphenanthracene	2.1E3	(2.7E3)	(8.2E4)	2.1E2	1.3E-2	8
21B	chrysene	2.9E3	4.4E-1	1.3E1	2.9E2	1.9E-2	38
21B	methylchrysene	1.2E3	8.2E-1	2.5E1	5.4E2	3.5E-2	28
21B	triphenylene	2.9E3	(3.7E3)	(1.1E5)	2.9E2	1.9E-2	5
21B	pyrene	2.4E3	3.5E-3	1.1E-1	2.4E2	1.5E-2	71
21B	methylpyrene	3.8E3	(5.5E-3)	(1.7E-1)	3.8E2	2.4E2	65

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

Table 5-4. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
21B	methyltri-phenylene	1.2E3	(1.5E3)	(4.6E4)	1.2E2	7.7E-3	14
21C	benzoperylene	5.0E2	(8.3E3)	(2.5E5)	5.0E1	3.2E-3	3
21C	benzopyrene	8.0E2	1.3E4	4.0E5	8.0E1	5.1E-3	1
21C	perylene	8.0E2	(1.3E4)	(4.0E5)	8.0E1	5.1E-3	1
22A	indene	3.0E2	2.1E-3	6.4E-2	3.0E1	1.9E-3	83
22A	C_2-alkylindene	3.0E2	(2.1E-3)	(6.4E-2)	3.0E1	1.9E-3	83
22A	fluorene	2.4E3	(1.7E-2)	(5.2E-1)	2.4E2	1.5E-2	53
22A	methylfluorene	2.1E3	(1.5E-2)	(4.6E-1)	2.1E2	1.3E-2	55
22B	fluoranthene	1.4E3	5.0E-3	1.5E-1	1.4E2	9.0E-3	66
22B	benzofluorene	3.8E3	1.4E-2	4.3E-1	3.8E2	2.4E-2	56
23A	C_3-aklypyri-dine	1.0E2	(2.2E-3)	(6.7E-2)	1.0E1	6.4E-4	79
23A	C_4-alkyl-pyridine	2.0E2	(4.4E-3)	(1.3E-1)	2.0E1	1.3E-3	68

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

Table 5-4. . Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
23B	acridine	9.0E2	3.3E-3	1.0E-1	9.0E1	5.8E-3	74
23B	methylacridine	4.0E2	(1.5E-3)	(4.6E-2)	4.0E1	2.0E-3	86
23B	C_2-alkylacridine	9.0E2	(3.3E-3)	(1.0E-1)	9.0E1	5.8E-3	74
23B	C_3-alkylacridine	6.0E2	(2.2E-3)	(6.7E-2)	6.0E1	3.8E-3	79
23B	quinoline	1.9E4	4.0E-1	1.2E1	1.9E3	1.2E-1	39
23B	methylquinoline	6.0E2	3.5E-3	1.1E-1	6.0E1	3.8E-3	71
23B	C_2-alkylquinoline	2.3E3	(4.9E-2)	(1.5E0)	2.3E2	1.5E-2	50
23B	C_3-alkylquinoline	1.1E3	(2.3E-2)	(7.0E-1)	1.1E2	7.0E-3	52
23B	benzoquinoline	7.0E2	(2.6E-3)	(7.9E-2)	7.0E1	4.5E-3	78
23B	methylbenzoquinoline	1.1E3	(4.1E-3)	(1.2E-1)	1.1E2	7.0E-3	70
23B	C_2-alkylbenzoquinoline	3.0E3	(1.1E-2)	(3.3E-1)	3.0E2	1.9E-2	59

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Table 5-4. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
23B	C_3-alkylbenzo-quinoline	6.0E2	(2.2E-3)	(6.7E-2)	6.0E1	3.8E-3	79
23C	carbazole	4.0E2	5.9E-3	1.8E-1	4.0E1	2.6E-3	64
23C	methylcarba-zole	2.0E2	2.9E-3	8.8E-2	2.0E1	1.3E-3	76
29	potassium	3.0E3	(5.0E-1)	(1.5E1)	3.0E2	1.9E-2	36
30	rubidium	5.0E-1	1.4E-6	4.3E-5	5.0E-2	3.2E-6	100
33	magnesium	2.0E2	1.1E-2	3.3E-1	2.0E1	1.3E-3	59
35	strontium	2.0E1	2.2E-3	6.7E-2	2.0E0	1.3E-4	79
36	barium	5.0E1	5.0E-2	1.5E0	5.0E0	3.2E-4	48
37	boron	1.0E0	1.1E-4	3.3E-3	1.0E-1	6.4E-6	94
39	gallium	<9.0E0	6.0E-4	1.8E-2	9.0E-1	5.8E-5	88

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Table 5-4. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
46	lead	5.0E1	1.0E0	3.0E1	5.0E0	3.2E-4	25
49	arsenic	<2.0E-1	5.0E-1	1.5E1	2.0E-2	1.3E-6	36
50	antimony	8.0E1	5.3E-1	1.6E1	8.0E-1	5.1E-4	34
51	bismuth	5.0E0	4.2E-3	1.3E-1	5.0E-1	3.2E-5	68
53	sulphur	2.0E3	(5.0E-2)	(1.5E0)	2.0E2	1.3E-2	48
54	selenium	3.0E-3	3.0E-4	9.1E-3	3.0E-4	1.9E-8	91
56	fluorine	2.0E1	2.7E-3	8.2E-2	2.0E0	1.3E-4	77
59	iodine	5.0E0	(1.9E-5)	5.8E-4	5.0E1	3.2E-5	97
60	scandium	<1.0E0	6.3E-6	1.9E-4	1.0E-1	6.4E-6	99
61	yttrium	1.0E0	3.3E-4	1.0E-2	1.0E-1	6.4E-6	90
65	vanadium	1.0E0	2.0E-3	6.1E-2	1.0E-1	6.4E-6	78
66	niobium	≤5.0E0	7.7E-5	2.3E-3	5.0E-1	3.2E-5	70
68	chromium	5.0E1	3.1E2	9.5E3	5.0E0	3.2E-4	7

$\sum$DS = _____

$\sum$WDS = _____

$\sum$WDS/CR = _____

$\sum$WDS/ER = _____

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Table 5-4. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors µg/g coal	Production Factors µg/J Product	Discharge Severity Ranking
78	copper	3.0E2	3.0E0	9.1E0	3.0E1	1.9E-3	22
82	cadmium	<6.0E0	6.0E-1	1.8E1	6.0E-1	3.8E-5	31
83	mercury	6.0E-2	3.0E-1	9.1E0	6.0E-3	3.8E-7	41
84	lanthanum	5.0E0	1.5E-5	4.6E-4	5.0E-1	3.2E-5	98
84	cerium	5.0E0	4.5E-5	1.4E-3	5.0E-1	3.2E-5	96

$\sum DS = \frac{6.67E4\ (1.57E4)}{}$

$\sum WDS = \frac{2.03E5\ (4.78E5)}{}$ g/s

$\sum WDS/CR = \frac{6.67E3\ (1.57E3)}{}$ g/g

$\sum WDS/ER = \frac{4.27E-1\ (1.01E-1)}{}$ g/J

TABLE 5-5. ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Chapman Gasifier

Coal Type: Presized Va. Low-sulfur Bituminous

Stream Description: Separator Vent Gas-Discharge

Stream Flow Rate*: 5.39E-2 Nm^3/s, ——— ℓ/s, 5.39E1 g/s

Coal Feed Rate (CR): 3.04E2 g/s (1.21E0 tph)

Product Flow Rate: 9.52E-1 Nm^3/s (1.21E5 SCFH)

Product Heating Value: 4.99E6 J/Nm^3 (1.34E2 Btu/SCF)

Energy Production Rate (ER): 4.75E6 J/s (1.62E7 Btu/hr)

*Assumes a density of 1.00E3g/Nm^3

continued

Table 5-5. Continued

MEG Category	Chemical Name	Concentration (µg/m³)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	$^{C}_{6}$ alkanes	5.2E4	(1.5E-1)	(8.1E0)	9.2E0	5.9E-4	54
01C	phenylacetylene	1.4E3	(5.2E-4)	(2.8E-2)	2.5E-1	1.6E-5	102
03A	methylanisole	2.0E3	(1.2E-2)	(6.5E-1)	3.5E-1	2.3E-5	88
05A	$^{C}_{6}$ aliphatic alcohols	8.2E2	(2.3E-3)	(1.2E-1)	1.5E-1	9.3E-6	97
07B	acetophenone	1.8E2	4.4E-3	2.4E-1	3.2E-2	2.0E-6	96
08A	phthalic acid	1.0E3	7.7E-3	4.2E-1	2.8E-1	1.8E-5	91
08D	adipate esters	4.9E4	6.8E-1	3.7E1	8.7E0	5.6E-4	46
08D	phthalate esters	3.1E4	6.2E0	3.3E2	5.5E0	3.5E-4	20
09B	benzonitrile	1.1E3	3.4E-2	1.8E0	2.0E-1	1.2E-5	79
09B	cyanotoluene	9.2E2	2.9E-2	1.6E0	1.6E-1	1.0E-5	82
10C	aniline	9.2E2	4.8E-2	2.6E0	1.6E-1	1.0E-5	77
10C	aminotoluene	2.7E3	2.5E1	1.3E3	4.8E-1	3.1E-5	9

$\sum$DS = _____

$\sum$WDS = _____

$\sum$WDS/CR = _____

$\sum$WDS/ER = _____

Table 5-5. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
10C	C_3-alkylaniline	3.7E3	(1.9E-1)	(1.0E1)	6.6E-1	4.2E-5	52
15A	C_2-alkylbenzene	7.0E3	(2.3E0)	(1.2E2)	1.2E0	7.9E-5	30
15A	styrene	6.2E3	1.5E-2	8.1E-1	1.1E0	7.0E-5	87
15A	C_3-alkylbenzene	2.3E4	(7.7E0)	(4.2E2)	4.1E0	2.6E-4	17
15B	indane	2.0E4	8.9E-2	4.8E0	3.5E0	2.3E-4	64
15B	methylindane	1.8E4	(8.0E-2)	(4.3E0)	3.2E0	2.0E-4	65
15B	C_2-alkylindane	2.1E4	(9.3E-2)	(5.0E0)	3.7E0	2.4E-4	62
15B	C_3-alkylindane	3.2E4	(1.4E-1)	(7.5E0)	5.7E0	3.6E-4	55
18A	phenol	8.0E4	4.2E0	2.3E2	1.4E1	9.1E-4	25
18A	cresol	2.7E5	2.7E1	1.5E3	4.8E1	3.1E-3	7
18A	C_2-alkylphenol	2.3E5	2.3E1	1.2E4	4.1E1	2.6E-3	10
18A	C_3-alkylphenol	1.8E4	1.8E0	9.7E1	3.2E0	2.0E-4	35

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Table 5-5. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
18A	C_4-alkylphenol	2.1E3	(2.3E-1)	1.2E1	3.7E-1	2.4E-5	49
21A	naphthalene	8.8E4	1.8E0	9.7E1	1.6E1	1.0E-3	35
21A	methylnaphthalene	1.9E5	8.6E-1	4.6E1	3.4E1	2.2E-3	42
21A	C_2-alkylnaphthalene	1.5E5	(6.7E-1)	(3.6E1)	2.7E1	1.7E-3	47
21A	acenaphthene	4.1E4	(2.6E1)	(1.4E3)	7.3E0	4.7E-4	8
21A	methylacenaphthene	1.6E4	(1.0E1)	(5.4E2)	2.8E0	1.8E-4	14
21A	C_2-alkylacenaphthene	2.5E3	(1.6E0)	(8.6E1)	4.4E-1	2.8E-5	38
21A	C_3-alkylacenaphthene	3.5E3	(2.2E0)	(1.2E2)	6.2E-1	4.0E-5	31
21A	acenaphthylene	1.0E4	(6.3E0)	(3.4E2)	1.8E0	1.1E-4	19
21A	methylacenaphthylene	5.5E3	(3.4E0)	(1.8E2)	9.8E-1	6.2E-5	27

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Table 5-5. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
21A	C_2-alkylace-napthylene	2.5E3	(1.6E0)	(8.6E1)	(4.4E-1)	(2.8E-5)	38
21A	anthracene	4.2E3	7.5E-2	4.0E0	7.4E-1	4.8E-5	70
21A	methylanthra-cene	1.0E3	(1.8E-2)	(9.7E-1)	1.8E-1	1.1E-5	86
22A	fluorene	5.5E3	(1.2E-1)	(6.5E0)	9.8E-1	6.2E-5	57
22A	methylfluorene	2.5E3	(5.6E-2)	(3.0E0)	4.4E-1	2.8E-5	75
22A	indene	9.2E4	2.0E0	1.1E2	1.6E1	1.0E-3	32
22A	methylindene	8.4E4	(1.9E0)	(1.0E2)	1.5E1	9.5E-4	34
22A	C_2-alkylindene	3.8E4	(8.4E-1)	(4.5E1)	6.7E0	4.3E-4	43
22A	C_3-alkylindene	8.0E3	(1.8E-1)	(9.7E0)	1.4E0	9.1E-5	53
23A	pyridine	9.2E2	6.1E-2	3.3E0	1.6E-1	1.0E-5	73
23A	methylpyridine	4.0E3	1.1E-1	5.9E0	7.1E-1	4.5E-5	58
23A	C_2-alkylpyri-dine	1.6E4	(1.1E0)	(5.9E1)	2.8E0	1.8E-4	40

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

Table 5-5. Continued

MEG Category	Chemical Name	Concentration (µg/m³)	Discharge Severity	Weighted Discharge Severity	Production Factors µg/g coal	Production Factors µg/J Product	Discharge Severity Ranking
23A	C_3-alkylpyridine	1.0E4	(6.7E-1)	(3.6E1)	1.8E0	1.1E-4	47
23B	quinoline	9.2E2	5.8E-2	3.1E0	1.6E-1	1.0E-5	74
23B	methylquinoline	3.5E3	6.4E-2	3.4E1	6.2E-1	4.0E-5	72
23B	C_2-alkylquinoline	1.5E3	(9.4E-2)	(5.1E0)	2.7E-1	1.7E-5	61
23B	C_3-alkylquinoline	4.6E2	(2.9E-2)	(1.6E0)	8.2E-2	5.2E-6	82
27	lithium	4.0E1	1.8E0	9.7E1	7.1E-3	4.5E-7	35
28	sodium	4.0E3	7.5E-2	4.0E0	7.1E-1	4.5E-5	70
29	potassium	2.0E3	1.0E0	5.4E1	3.5E-1	2.3E-5	41
30	rubidium	5.0E-1	4.2E-6	2.3E-4	8.9E-5	5.7E-9	107
33	magnesium	2.0E2	3.3E-2	1.8E0	3.5E-2	2.3E-6	80
34	calcium	2.0E3	1.3E-1	7.0E0	3.5E-1	2.3E-5	56

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Table 5-5. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
35	strontium	2.0E1	6.7E-3	3.6E-1	3.5E-3	2.3E-7	93
36	barium	4.0E1	8.0E-2	4.3E0	7.1E-3	4.5E-7	65
37	boron	3.0E0	9.7E-4	5.2E-2	5.3E-4	3.4E-8	99
38	aluminum	4.0E1	7.7E-3	4.2E-1	7.1E-3	4.5E-7	91
39	gallium	3.0E0	6.0E-4	3.2E-2	5.3E-4	3.4E-8	101
42	carbonate	2.0E0	(2.2E-7)	(1.2E-5)	3.5E-4	2.3E-8	108
42	carbon dioxide	3.0E7	3.3E0	1.8E2	5.3E3	3.4E-1	28
42	carbon monoxide	4.0E7	1.0E3	5.4E4	7.1E3	4.5E-1	1
43	silicon	3.0E2	3.0E-2	1.6E0	5.3E-2	3.4E-6	81
45	tin	8.0E0	(7.3E-4)	(3.9E-2)	1.4E-3	9.1E-8	100
46	lead	3.0E1	2.0E-1	1.1E 1	5.3E-3	3.4E-7	50
47	nitrogen oxide	4.0E4	4.4E0	2.4E 2	7.1E0	4.5E-4	24
47	nitrogen dioxide	3.0E5	3.3E1	1.8E 3	5.3E1	3.4E-3	5

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$\sum WDS$ = _____ $\sum WDS/ER$ = _____

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Table 5-5. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
47	ammonia	7.0E5	3.9E1	2.1E3	1.2E2	7.9E-3	4
47	cyanide	5.0E4	2.5E0	1.3E2	8.9E0	5.7E-4	29
48	phosphorus	3.0E3	3.0E1	1.6E3	5.3E-1	3.4E-5	6
49	arsenic	1.0E1	5.0E0	2.7E2	1.8E-3	1.1E-7	21
50	antimony	<5.0E1	1.0E-1	5.4E0	8.9E-3	5.7E-7	59
53	sulfur	1.0E4	(7.7E-1)	(4.2E1)	1.8E0	1.1E-4	44
53	sulfide	2.0E5	1.3E1	7.0E2	3.5E1	2.3E-3	11
53	sulfate	<5.0E3	(5.0E0)	(2.7E2)	8.9E-1	5.7E-5	21
53	thiocyanate	1.0E5	(9.1E0)	(4.9E2)	1.8E1	1.1E-3	16
53	sulfur dioxide	9.0E3	6.9E-1	3.7E1	1.6E0	1.0E-4	45
53	carbonyl sulfide	4.0E4	1.1E1	5.9E2	7.1E0	4.5E-4	13
53	hydrogen sulfide	2.0E5	1.3E1	7.0E2	3.5E1	2.3E-3	11

$\sum OS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

Table 5-5. Continued

MEG Category	Chemical Name	Concentration (µg/m³)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
53	carbon disulfide	2.0E4	6.7E0	3.6E2	3.5E0	2.3E-2	18
54	selenium	1.0E1	5.0E-2	2.7E0	1.8E-3	1.1E-7	76
56	fluorine	<5.0E1	2.0E-2	1.1E0	8.9E-3	5.7E-7	85
56	fluoride	2.0E2	8.0E-2	4.3E0	3.5E-2	2.3E-6	65
57	chlorine	2.0E2	(8.0E-2)	(4.3E0)	3.5E-2	2.3E-6	65
58	bromine	9.0E0	(1.3E-3)	(7.0E-2)	1.6E-3	1.0E-7	98
59	iodine	1.0E0	(1.4E-4)	(7.5E-3)	1.8E-4	1.1E-8	103
60	scandium	<2.0E0	3.8E-5	2.0E-3	3.5E-4	2.3E-8	105
62	titanium	4.0E1	6.7E-3	3.6E-1	7.1E-3	4.5E-7	93
63	zirconium	5.0E2	1.0E-1	5.4E-3	8.9E-2	5.7E-6	59
65	vanadium	1.0E2	2.0E-1	1.1E1	1.8E-2	1.1E6	50
68	chromium	3.0E2	3.0E2	1.6E4	5.3E-2	3.4E-6	2
69	molybdenum	4.0E2	8.0E-2	4.3E0	7.1E-2	4.5E-6	65

$\sum$DS = _____

$\sum$WDS = _____

$\sum$WDS/CR = _____

$\sum$WDS/ER = _____

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Table 5-5. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
70	tungsten	<8.0E0	8.0E-3	4.3E-1	1.4E-3	9.1E-8	90
71	manganese	5.0E1	1.0E-2	5.4E-1	8.9E-3	5.7E-7	89
72	iron	2.0E3	2.0E0	1.1E 2	3.5E-1	2.3E-5	32
74	cobalt	2.0E0	4.0E-2	2.2E 0	3.5E-4	2.3E-8	78
76	nickel	7.0E1	4.7E0	2.5E 2	1.2E-2	7.9E-7	23
78	copper	2.0E3	1.0E1	5.4E 2	3.5E-1	2.3E-5	14
79	silver	1.0E3	1.0E2	5.4E 3	1.8E-1	1.1E-5	3
81	zinc	1.0E2	2.5E-2	1.3E 0	1.8E-2	1.1E-6	84
82	cadmium	9.0E-1	9.0E-2	4.9E 0	1.6E-4	1.0E-8	63
83	mercury	<3.0E-1	6.0E-3	3.2E-1	5.3E-5	3.4E-9	95
84	lanthanum	3.0E0	2.7E-5	1.5E-3	5.3E-4	3.4E-8	106
84	cerium	4.0E0	1.1E-4	5.9E-3	7.1E-4	4.5E-8	104
85	uranium	4.0E1	4.4E0	2.4E2	7.1E-3	4.5E-7	24

$\sum DS$ = 1.76E3 (1.68E3)

$\sum WDS$ = 9.49E4 (9.03E4) g/s

$\sum WDS/CR$ = 3.12E2 (2.97E2) g/g

$\sum WDS/ER$ = 2.00E-2 (1.90E-2) g/J

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TABLE5-6. ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Chapman Gasifier

Coal Type: Presized Va. Low-sulfur Bituminous

Stream Description: Cyclone Dust-Discharge

Stream Flow Rate: _____ m^3/s, _____ ℓ/s, 1.61E0 g/s

Coal Feed Rate (CR): 3.04E2 g/s (1.21E0 tph)

Product Flow Rate: 9.52E-1 Nm^3/s (1.21E5 SCFH)

Product Heating Value: 4.99E6 J/Nm^3 (1.34E2 Btu/SCF)

Energy Production Rate (ER): 4.75E6 J/s (1.62E7 Btu/hr)

continued

Table 5-6. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
08D	adipate esters	3.0E0	(1.4E-5)	(2.3E-5)	1.6E-2	1.0E-6	31
08D	phthalate esters	9.0E0	6.0E-4	9.7E-4	4.8E-2	3.1E-6	27
21A	naphthalene	3.0E0	6.0E-5	9.7E-5	1.6E-2	1.0E-6	29
27	lithium	2.0E0	2.9E-2	9.7E-2	1.1E-2	6.8E-7	14
29	potassium	4.0E5	(6.7E1)	(1.1E2)	2.1E3	1.4E-1	2
30	rubidium	3.0E0	8.3E-6	1.3E-5	1.6E-2	1.0E-6	33
33	magnesium	5.0E2	2.8E-2	4.5E-2	2.6E0	1.7E-4	15
34	calcium	2.0E3	4.2E-2	6.8E-2	1.1E1	6.8E-4	12
35	strontium	8.0E1	8.7E-3	1.4E-2	4.2E-1	2.7E-5	20
36	barium	5.0E2	5.0E-1	8.1E-1	2.6E0	1.7E-4	10
37	boron	7.0E0	7.5E-4	1.2E-3	3.7E-2	2.4E-6	25
38	aluminum	1.0E2	6.3E-3	1.0E-2	5.3E-1	3.4E-5	23

$\sum OS$ = _____ $\sum WOS/CR$ = _____

$\sum WOS$ = _____ $\sum WOS/ER$ = _____

Table 5-6. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
39	gallium	<1.0E1	6.7E-4	1.1E-3	5.3E-2	3.4E-6	26
43	silicon	2.0E3	6.7E-3	1.1E-2	1.1E0	6.8E-5	22
46	lead	6.0E1	1.2E0	1.9E0	3.2E-1	2.0E-5	7
48	phosphorus	8.0E3	2.7E0	4.3E0	4.2E1	2.7E-3	5
49	arsenic	<4.0E-1	1.0E0	1.6E0	2.1E-3	1.4E-7	8
50	antimony	1.0E2	6.7E-1	1.1E0	5.3E-1	3.4E-5	11
53	sulfur	3.0E2	7.5E-3	(1.2E-2)	1.6E0	1.0E-4	21
56	fluorine	1.0E2	1.3E-2	2.1E-2	5.3E-1	3.4E-5	18
60	scandium	2.0E0	1.3E-5	2.1E-5	1.1E-2	6.8E-7	32
61	yttrium	1.0E1	3.3E-3	5.3E-3	5.3E-2	3.4E-6	24
62	titanium	2.0E2	1.1E-2	1.8E-2	1.1E0	6.6E-5	19
63	zirconium	3.0E1	2.0E-2	3.2E-2	1.6E-1	1.0E-5	16
65	vanadium	2.0E1	4.0E-2	6.4E-2	1.1E-1	6.8E-6	13

$\sum$DS = _____

$\sum$WDS = _____

$\sum$WDS/CR = _____

$\sum$WDS/ER = _____

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Table 5-6. Continued

MEG Category	Chemical Name	Concentration (µg/ g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
68	chromium	3.0E1	1.9E2	3.1E2	1.6E-1	1.0E-5	1
71	mangenese	2.0E2	4.0E0	6.4E0	1.1E0	6.8E-5	4
72	iron	2.0E3	6.7E0	1.1E0	1.0E0	6.8E-5	3
74	cobalt	3.0E0	2.0E0	3.2E-2	1.6E-2	1.0E-6	16
76	nickel	1.0E2	2.0E0	3.2E0	5.3E-1	3.4E-5	6
78	copper	9.0E2	9.0E-1	1.4E0	9.8E0	3.1E-4	9
84	lanthanum	2.0E1	5.9E-5	9.5E-5	1.1E-1	6.8E-6	30
84	cerium	2.0E1	1.8E-4	2.9E-4	1.1E-1	6.8E-6	27

$\sum DS$ = 2.75E2 (2.08E2)

$\sum WDS$ = 4.42E2 (3.34E2) g/s

$\sum WDS/CR$ = 1.45E0 (1.10E0) g/g

$\sum WDS/ER$ = 9.31E-5 (7.03E-5) g/J

TABLE 5-7. ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Chapman Gasifier

Coal Type: Presized Va. Low-sulfur Bituminous

Stream Description: Gasifier Ash-Discharge

Stream Flow Rate: ——— m^3/s, ——— ℓ/s, 1.85E1 g/s

Coal Feed Rate (CR): 3.04E2 g/s (1.21E0 tph)

Product Flow Rate: 9.52E-1 Nm^3/s (1.21E5 SCFH)

Product Heating Value: 4.99E6 J/Nm^3 (1.34E2 Btu/SCF)

Energy Production Rate (ER): 4.75E6 J/s (1.62E7 Btu/hr)

continued

Table 5-7. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	$>C_6$ alkanes	2.0E0	(1.8E-6)	(3.3E-5)	1.2E-1	7.8E-6	40
01A	$\geq C_{13}$ alkanes	2.0E0	(6.5E-7)	(1.2E-5)	1.2E-1	7.8E-6	41
08D	phthalate esters	2.3E0	1.5E-4	2.8E-3	1.4E-1	9.0E-6	36
15A	C_2- alkyl-benzene	1.0E0	(1.1E-4)	(2.0E-3)	6.1E-2	3.9E-6	37
21A	naphthalene	3.0E0	2.0E-5	3.7E-4	1.8E-1	1.2E-5	38
21A	methyl-napthalene	2.0E0	3.0E-6	5.6E-5	1.2E-1	7.8E-6	39
27	lithium	7.0E1	1.0E0	1.9E1	4.3E0	2.7E-4	9
29	potassium	1.0E4	(1.7E0)	(3.1E1)	6.1E2	3.9E-2	6
30	rubidium	2.0E4	5.6E-2	1.0E0	1.2E3	7.8E-2	23
32	beryllium	1.0E1	5.9E0	1.1E2	6.1E-1	3.9E-5	3
33	magnesium	6.0E3	3.3E-1	6.1E0	3.7E2	2.3E-2	16
34	calcium	5.0E4	1.0E0	1.9E1	3.0E3	1.9E-1	9

$\sum$DS = _____ $\sum$WDS/CR = _____

$\sum$WDS = _____ $\sum$WDS/ER = _____

Table 5-7. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
35	strontium	2.0E3	2.2E-2	4.1E-1	1.2E2	7.8E-3	27
36	barium	2.0E3	2.0E0	3.7E-1	1.2E2	7.8E-3	5
37	boron	2.0E1	2.2E-3	4.1E-2	1.2E0	7.8E-5	31
38	aluminum	3.0E3	1.9E-1	3.5E0	1.8E2	1.2E-2	20
39	gallium	5.0E1	3.3E-3	6.1E-2	3.0E0	1.9E-4	30
43	silicon	7.0E3	2.3E-1	4.3E0	4.3E2	2.7E-2	19
45	tin	3.0E2	5.0E-2	9.3E-1	1.8E1	1.2E-3	13
46	lead	2.0E1	4.0E-1	7.4E0	1.2E0	7.8E-5	14
48	phosphorus	8.0E2	2.7E-1	5.0E0	4.9E1	3.1E-3	18
49	arsenic	<4.0E-1	1.0E0	1.9E1	2.4E-2	1.6E-6	28
50	antimony	2.0E2	1.3E0	2.5E1	1.2E1	7.8E-4	8
53	sulfur	1.0E3	(2.5E-2)	(4.6E-1)	6.1E1	3.9E-3	26
54	selenium	3.0E1	3.0E0	5.6E1	1.8E0	1.2E-4	4

$\sum$DS = _____

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Table 5-7. Continued

MEG Category	Chemical Name	Concentration (µg/g)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
56	fluorine	<2.0E2	2.7E-2	5.0E-1	1.2E1	7.8E-4	25
60	scandium	5.0E1	3.1E-4	5.7E-3	3.0E0	1.9E-4	33
61	yttrium	<2.0E1	6.7E-3	1.2E-1	1.2E0	7.8E-5	29
62	titanium	3.0E3	1.7E-1	3.1E0	1.8E2	1.2E-2	18
63	zirconium	9.0E1	6.0E-2	1.1E0	5.5E0	3.5E-4	21
65	vanadium	3.0E1	6.0E-2	1.1E0	1.8E0	1.2E-4	21
66	niobium	2.0E1	3.1E-4	5.7E-3	1.2E0	7.8E-5	33
68	chromium	3.0E1	1.9E2	3.4E3	1.8E0	1.2E-4	1
72	iron	1.0E4	3.3E1	6.1E2	6.1E2	3.9E-2	2
74	cobalt	5.0E1	3.3E-1	6.1E0	3.0E0	1.9E-4	16
78	copper	1.0E3	1.0E0	1.9E1	6.1E1	3.9E-3	9
82	cadmium	<9.0E0	9.0E-1	1.7E1	5.5E-1	3.5E-5	14
83	mercury	<3.0E-1	1.5E0	2.8E1	1.8E-2	1.2E-6	7

$\sum$DS = _____

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$\sum$WDS/CR = _____

$\sum$WDS/ER = _____

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Table 5-7. Continued

MEG Category	Chemical Name	Concentration (μg/g)	Discharge Severity.	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					μg/g coal	μg/J Product	
84	lanthanum	1.0E2	2.9E-4	5.4E-3	6.1E0	3.9E-4	35
84	cerium	9.0E1	8.2E-4	1.5E-2	5.5E0	3.5E-4	32
85	uranium	4.0E2	3.3E-2	6.1E-1	2.4E1	1.6E-3	24

$$\sum DS = \frac{2.42E2 \quad (2.41E2)}{\qquad\qquad}$$

$$\sum MDS = \frac{4.48E3 \quad (4.45E3)}{\qquad\qquad} \quad g/s$$

$$\sum MDS/CR = \frac{1.47E1 \quad (1.47E1)}{\qquad\qquad} \quad g/g$$

$$\sum MDS/ER = \frac{9.43E-4 (9.38E-4)}{\qquad\qquad} \quad g/J$$

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TABLE 5-8 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Chapman Gasifier
Stream Description: Coal Feeder Vent Gas
Coal Type: Presized Va. Low-sulfur
Stream Flow Rate: 6.11E0 g/s
Stream Type: Bituminous Gaseous

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	21C	benzo(a)pyrene	100,000
1*	21C	perylene	100,000
3	68	chromium	1,000
4	42	carbon monoxide	1,000
5	85	uranium	100
6*	21D	benzoperylene	10
7*	23C	pyrroline	10
8*	21A	acenaphthylene	10
9*	23B	methylbenzophenanthridine	10
10*	15A	biphenylene	10
11	21A	phenathrene	10
11*	57	chlorine	10
13	83	mercury	10
14	10C	methylaminonaphthalene	10
15	53	thiocyanate	10
16*	21A	binaphthyl	10
17*	21A	methylacenaphthylene	10
18	53	carbon disulfide	10
19	53	hydrogen sulfide	10
20	29	potassium	10

*Based on supplemental MEG values

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TABLE 5-8 (continued).

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
21	10C	aminonaphthalene	1
22*	21A	methylacenaphthalene	1
23	21B	chrysene	1
24	82	cadmium	1
25*	57	chloride	1
26*	21A	C_2-alkylacenaphthylene	1
27	53	carbonyl sulfide	1
28*	15A	C_2-alkylbenzene	1
29*	21A	C_2-alkylacenaphthalene	1
30	48	phosphorus	1
30	49	arsenic	1
30	78	copper	1
33	38	aluminum	1
34	47	ammonia	1
35*	15A	C_3-alkylbenzene	1
36	18A	cresol	1
36	42	carbon dioxide	1
36	47	nitrogen oxide	1
36	85	thorium	1
40	18A	C_2-alkylphenol	1

*Based on supplemental MEG values

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TABLE 5-9. RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Chapman Gasifier
Stream Description: Separator Liquor
Coal Type: Presized Va. Low-sulfur Bituminous
Stream Flow Rate: +
Stream Type: Liquid

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1*	18A	C_2-alkylphenols	100,000
2*	18A	C_3-alkylphenols	10,000
3	47	ammonia	1,000
4	47	cyanide	1,000
5	49	arsenic	100
6*	21C	benzoperylene	100
7	18A	phenol	10
8	54	selenium	10
9	53	sulfide	10
10*	42	carbonate	10
11	56	fluoride	10
12	10C	aminotoluenes	1
13	57	chloride	1
14	48	phosphorus	1

*Based on supplemental MEG values

+Separator Liquor is recycled: no stream flow rate

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TABLE 5-10 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Chapman Gasifier
Stream Description: By-Product Tar
Coal Type: Presized Va. Low-sulfur
Stream Flow Rate: 3.04E1 g/s
Stream Type: Bituminous Solid

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	21C	benzopyrene	10,000
1*	21C	perylene	10,000
3*	21C	benzoperylene	10,000
4*	18A	C_2-alkylphenol	10,000
5*	21B	triphenylene	1,000
5*	18C	hydroxybenzofluorene	1,000
7*	21B	methylphenanthracene	1,000
8*	18C	C_2-alkylhydroxypyrene	1,000
9*	18C	C_5-alkylhydroxyanthracene	1,000
9*	18C	methylnaphthol	1,000
11	18C	naphthol	1,000
12*	18C	C_2-alkylacenaphthol	1,000
13*	21B	methyltriphenylene	1,000
13*	18C	hydroxyanthracene	1,000
15*	18A	C_3-alkylphenol	1,000
16*	18C	methylacenaphthol	1,000
17*	18C	C_3-alkylacenaphthol	1,000
18	68	chromium	100
19	18C	indanol	100
19*	18C	C_2-alkylnaphthol	100
19*	18C	acenaphthol	100

*Based on supplemental MEG values

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TABLE5-10(continued).

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
22	08D	phthalate esters	1
22	10C	benzofluoreneamine	1
22	78	copper	1
25	10C	aminotetralin	1
26	49	lead	1

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TABLE 5-1] RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Chapman Gasifier
Stream Description: Separator Vent Gas
Coal Type: Presized Va. Low-sulfur Bituminous
Stream Flow Rate: 5.39E1 g/s
Stream Type: Gaseous

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	42	carbon monoxide	1,000
2	68	chromium	100
3	79	silver	100
4	47	ammonia	10
5	47	nitrogen dioxide	10
6	48	phosphorus	10
7	18A	cresol	10
8*	21A	acenaphthene	10
9	10C	aminotoluene	10
10	18A	C_2-alkylphenol	10
11	53	hydrogen sulfide	10
11	53	sulfide	10
13	53	carbonyl sulfide	10
14*	21A	methylacenaphthene	10
14	78	copper	10
16*	53	thiocyanate	10
17*	15A	C_3-alkylbenzene	10
18	53	carbon disulfide	10
19*	21A	acenaphthylene	10
20	08D	phthalate esters	10
21	49	arsenic	10

*Based on supplemental MEG values

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TABLE5-1(continued).

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
22	53	sulfate	10
23	76	nickel	1
24	85	uranium	1
24	47	nitrogen oxide	1
26	18A	phenol	1
27*	21A	methylacenaphthylene	1
28	42	carbon dioxide	1
29	47	cyanide	1
30*	15A	C_2-alkylbenzene	1
31*	21A	C_3-alkylacenaphthene	1
32	22A	indene	1
32	72	iron	1
34*	22A	methylindene	1
35	27	lithium	1
35*	18A	C_3-alkylphenol	1
35	21A	naphthalene	1
38*	21A	C_2-alkylacenaphthene	1
38*	21A	C_2-alkylacenaphthylene	1
40*	23A	C_2-alkylpyridine	1
41	29	potassium	1

*Based on supplemental MEG values

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TABLE 5-12 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Chapman Gasifier
Stream Description: Cyclone Dust
Coal Type: Presized Va. Low-sulfur Bituminous
Stream Flow Rate: 1.61E0 g/s
Stream Type: Solid

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	68	chromium	100
2*	29	potassium	100
3	72	iron	10
4	71	manganese	1
5	48	phosphorus	1
6	76	nickel	1
7	46	lead	1
8	49	arsenic	1

*Based on supplemental MEG values

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TABLE 5-13 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Chapman Gasifier — Stream Description: Gasifier Ash

Coal Type: Presized Va. Low-sulfur Bituminous — Stream Flow Rate: 1.85E1 g/s

Stream Type: Solid

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	68	chromium	100
2	72	iron	10
3	32	beryllium	10
4	54	selenium	1
5	36	barium	1
6*	29	potassium	1
7	83	mercury	1
8	50	antimony	1
9	49	arsenic	1
9	27	lithium	1
9	34	calcium	1
9	78	copper	1

*Based on supplemental MEG values

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TABLE 5-14 RANKING OF POLLUTANTS VIA DISCHARGE SEVERITY BY PHASE

Process: Chapman Gasifier

Coal Type: Presized Va. Low-sulfur Bituminous

Stream Type: Solid

Ranking	MEG Category	POLLUTANT	Discharge Severity Order of Magnitude
1	68	chromium	100
2*	29	potassium	100
3	72	iron	10
4	32	beryllium	10
5	71	manganese	.1
6	54	selenium	1
7	48	phosphorus	1
8	76	nickel	1
8	36	barium	1
10	83	mercury	1
11	50	antimony	1
12	46	lead	1
13	49	arsenic	1
13	34	calcium	1
13	78	copper	1
13	27	lithium	1

*Based on supplemental MEG values

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TABLE 5-15 RANKING OF POLLUTANTS VIA DISCHARGE SEVERITY BY PHASE

Process: Chapman Gasifier

Coal Type: Presized Va. Low-sulfur Bituminous

Stream Type: Liquid

Ranking	MEG Category	POLLUTANT	Discharge Severity Order of Magnitude
1*	18A	C_2-alkylphenols	100,000
2*	18A	C_3-alkylphenols	10,000
3	47	ammonia	1,000
4	47	cyanide	1,000
5	49	arsenic	100
6*	21C	benzoperylene	100
7	18A	phenol	10
8	54	selenium	10
9	53	sulfide	10
10*	42	carbonate	10
11	56	fluoride	10
12	10C	aminotoluenes	1
13	57	chloride	1
14	48	phosphorus	1

*Based on supplemental MEG values

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TABLE 5-16 RANKING OF POLLUTANTS VIA DISCHARGE SEVERITY BY PHASE

Process: Chapman Gasifier

Coal Type: Presized Va. Low-sulfur Bituminous

Stream Type: Gaseous

Ranking	MEG Category	POLLUTANT	Discharge Severity Order of Magnitude
1	21C	benzo(a)pyrene	100,000
1*	21C	perylene	100,000
3	42	carbon monoxide	1,000
4	68	chromium	1,000
5	79	silver	100
6	85	uranium	100
7	47	ammonia	10
8*	21D	benzoperylene	10
9	47	nitrogen dioxide	10
10	48	phosphorus	10
11	18A	cresol	10
12*	21A	acenaphthene	10
13	10C	aminotoluene	10
14	18A	C_2-alkylphenol	10
15*	23C	pyrroline	10
16*	21A	acenaphthylene	10
17*	23B	methylbenzophenathridine	10
18	53	hydrogen sulfide	10
18	53	sulfide	10
18*	15A	biphenylene	10
21	21A	phenanthrene	10
21*	57	chlorine	10

* Based on supplemental MEG values

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TABLE 5-1 (continued). RANKING OF POLLUTANTS VIA DISCHARGE SEVERITY BY PHASE

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
23	53	carbonyl sulfide	10
24	78	copper	10
24	83	mercury	10
24*	21A	methylacenaphthene	10
27	10C	methylaminonaphthalene	10
28*	53	thiocyanate	10
29*	21A	binaphthyl	10
30*	21A	methylacenaphthylene	10
31*	15A	C_3-alkylbenzene	10
32	53	carbon disulfide	10
33	08D	phthalate esters	10
34	29	potassium	10
34	49	arsenic	10
34	53	sulfate	10
37	76	nickel	1
38	47	nitrogen oxide	1
39	18A	phenol	1
40	10C	aminonaphthalene	1
41	21B	chrysene	1
42	42	carbon dioxide	1
42*	21A	methylacenaphthalene	1
44	82	cadmium	1

*Based on supplemental MEG values

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TABLE 5-16 (continued). RANKING POLLUTANTS VIA DISCHARGE SEVERITY BY PHASE

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
45*	57	chloride	1
46*	21A	C_2-alkylacenaphthylene	1
47	47	cyanide	1
48*	15A	C_2-alkylbenzene	1
49*	21A	C_3-alkylacenaphthene	1
50*	21A	C_2-alkylacenaphthalene	1
51	22A	indene	1
51	72	iron	1
53	38	aluminum	1
53*	22A	methylindene	1
55	27	lithium	1
56	18A	C_3-alkylphenol	1
57	21A	naphthalene	1
58*	21A	C_2-alkylacenaphthene	1
59*	23A	C_2-alkylpyridine	1

*Based on supplemental MEG values

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TABLE 5-17 RANKING OF POLLUTANTS VIA DISCHARGE SEVERITY BY PHASE

Process: Chapman Gasifier

Coal Type: Presized Va. Low-sulfur Bituminous

Stream Type: Tars

Ranking	MEG Category	POLLUTANT	Discharge Severity Order of Magnitude
1	21C	benzopyrene	10,000
1*	21C	perylene	10,000
3*	21C	benzoperylene	10,000
4*	18A	C_2-alkylphenol	10,000
5*	21B	triphenylene	1,000
5*	18C	hydroxybenzofluorene	1,000
7*	21B	methylphenanthracene	1,000
8*	18C	C_2-alkylhydroxypyrene	1,000
9*	18C	C_5-alkylhydroxyanthracene	1,000
9*	18C	methylnaphthol	1,000
11	18C	naphthol	1,000
12*	18C	C_2-alkylacenaphthol	1,000
13*	21B	methyltriphenylene	1,000
13*	18C	hydroxyanthracene	1,000
15*	18A	C_3-alkylphenol	1,000
16*	18C	methylacenaphthol	1,000
17*	18C	C_3-alkylacenaphthol	1,000
18	68	chromium	100
19	18C	indanol	100
19*	18C	C_2-alkylnaphthol	100
19*	18C	acenaphthol	100

*Based on supplemental MEG values

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TABLE 5-1 (continued).

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
22	08D	phthalate esters	1
22	10C	benzofluoreneamine	1
22	78	copper	1
25	10C	aminotetralin	1
26	49	lead	1

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TABLE 5-18 RANKING OF POLLUTANTS VIA WEIGHTED DISCHARGE SEVERITY BY PHASE

Process: Chapman Gasifier

Coal Type: Presized Va. Low-sulfur Bituminous

Stream Type: Solid

Ranking	MEG Category	Pollutant	WDS/Coal Input
1	68	chromium	3.6E-4 g/J
2	72	iron	6.3E-5
3*	29	potassium	6.3E-5
4	32	beryllium	1.1E-5
5	54	selenium	5.8E-6
6	83	mercury	2.9E-6
7	50	antimony	2.6E-6
8	27	lithium	2.0E-6
8	34	calcium	2.0E-6
8	49	arsenic	2.0E-6
8	78	copper	2.0E-6
12	46	lead	7.6E-7
13	71	manganese	6.6E-7
14	48	phosphorus	5.2E-7
15	76	nickel	3.3E-7
16	36	barium	5.2E-8

*Based on supplemental MEG values

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TABLE5-19 RANKING OF POLLUTANTS VIA WEIGHTED DISCHARGE SEVERITY BY PHASE

Process: Chapman Gasifier

Coal Type: Presized Va. Low-sulfur Bituminous

Stream Type: Liquid

Ranking	MEG Category	Pollutant	WDS/J	Coal Input
		No WDS values for liquid streams.		

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TABLE 5-20 RANKING OF POLLUTANTS VIA WEIGHTED DISCHARGE SEVERITY BY PHASE

Process: Chapman Gasifier

Coal Type: Presized Va. Low-sulfur Bituminous

Stream Type: Gaseous

Ranking	MEG Category	Pollutant	WDS/J Coal Input
1	21C	benzo(a)pyrene	1.5E-1 g/J
1*	21C	perylene	1.5E-1
3	68	chromium	1.6E-3
4*	18A	C_2-alkylphenol	1.2E-3
5	79	silver	5.6E-4
6	42	carbon monoxide	3.2E-4
7	47	ammonia	2.2E-4
8	47	nitrogen dioxide	1.9E-4
9	48	phosphorus	1.6E-4
10	18A	cresol	1.5E-4
11*	21A	acenaphthene	1.4E-4
12	10C	aminotoluene	1.3E-4
13	53	hydrogen sulfide	7.2E-5
14	53	sulfide	7.1E-5
15	53	carbonyl sulfide	6.0E-5
16	78	copper	5.1E-5
16*	21A	methylacenaphthene	5.1E-5
18*	53	thiocyanate	5.0E-5
19	85	uranium	4.9E-5
20	15A	C_3-alkylbenzene	4.4E-5
21	53	carbon disulfide	3.7E-5
22*	21A	acenaphthylene	3.5E-5

*Based on supplemental MEG values

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TABLE 5-20 RANKING OF POLLUTANTS VIA WEIGHTED DISCHARGE SEVERITY BY PHASE

Process: Chapman Gasifier

Coal Type: Presized Va. Low-sulfur Bituminous

Stream Type: Gaseous

Ranking	MEG Category	Pollutant	WDS/J Coal Input
23	08D	phthalate esters	3.4E-5 g/J
24	49	arsenic	2.7E-5
24*	53	sulfate	2.7E-5
25	76	nickel	2.6E-5
26	47	nitrogen oxide	2.5E-5
27*	21D	benzoperylene	2.4E-5
28	18A	phenol	2.3E-5
29	42	carbon dioxide	1.9E-5
29*	21A	methylacenaphthylene	1.9E-5
31	47	cyanide	1.3E-5
32*	15A	C_2-alkylbenzene	1.2E-5
32*	21A	C_3-alkylacenaphthene	1.2E-5
32*	23C	pyrroline	1.2E-5
35	22A	indene	1.1E-5
35	72	iron	1.1E-5
37*	22A	methylindene	1.1E-5
38	21A	naphthalene	1.1E-5
38	27	lithium	1.1E-5
40	18A	C_3-alkylphenol	9.8E-6
41	23B	methylbenzophenathridine	9.5E-6
42*	21A	C_2-alkylacenaphthene	8.9E-6
42*	21A	C_2-alkylacenaphthylene	8.9E-6

* Based on supplemental MEG values

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TABLE5-20 RANKING OF POLLUTANTS VIA WEIGHTED DISCHARGE SEVERITY BY PHASE

Process: Chapman Gasifier

Coal Type: Presized Va. Low-sulfur Bituminous

Stream Type: Gaseous

Ranking	MEG Category	Pollutant	WDS/ Coal Input
44*	15A	biphenylene	8.2E-6 g/J
45	21A	phenanthrene	7.6E-6
45*	57	chlorine	7.6E-6
45*	57	chloride	7.6E-6
48	83	mercury	6.3E-6
49	10C	methylaminonaphthalene	6.1E-6
49*	23A	C_2-alkylpyridine	6.1E-6
51	29	potassium	5.6E-6
51*	21A	binaphthyl	5.6E-6
53	10C	aminonaphthalene	2.2E-6
54	21B	chrysene	2.1E-6
54*	21A	methylacenaphthalene	2.1E-6
56	82	cadmium	1.9E-6
57*	21A	C_2-alkylacenaphthalene	1.4E-6
58	38	aluminum	1.3E-6

*Based on supplemental MEG values

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TABLE 5-21 RANKING OF POLLUTANTS VIA WEIGHTED DISCHARGE SEVERITY BY PHASE

Process: Chapman Gasifier

Coal Type: Presized Va. Low-sulfur Bituminous

Stream Type: Tars

Ranking	MEG Category	Pollutant	WDS/Coal Input
1	21C	benzo(a)pyrene	4.1E-2 g/J
1*	21C	perylene	4.1E-2
3*	21C	benzoperylene	2.6E-2
4*	18A	C_2-alkylphenol	1.9E-2
5*	21B	triphenylene	1.1E-2
5*	18C	hydroxybenzofluorene	1.1E-2
7*	21B	methylphenanthracene	8.5E-3
8*	18C	C_2-alkylhydroxypyrene	6.6E-3
9*	18C	C_5-alkylhydroxyanthracene	6.3E-3
10*	18C	methylnaphthol	6.3E-3
11	18C	naphthol	5.7E-3
12*	18C	C_2alkylacenaphthol	5.1E-3
13*	21B	methyltriphenylene	4.8E-3
13*	18C	hydroxyanthracene	4.8E-3
15*	18A	C_3-alkylphenol	3.1E-3
16*	18C	methylacenaphthol	2.8E-3
17*	18C	C_3-alkylacenaphthol	2.2E-3
18	68	chromium	9.8E-4
19	18C	indanol	9.4E-4
19*	18C	C_2-alkylnaphthol	9.4E-4
19*	18C	acenaphthol	9.4E-4

*Based on supplemental MEG values

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TABLE 5-21 RANKING OF POLLUTANTS VIA WEIGHTED DISCHARGE SEVERITY BY PHASE

Process: Chapman Gasifier (cont'd)

Coal Type: Presized Va. Low-sulfur Bituminous

Stream Type: Tars

Ranking	MEG Category	Pollutant	WDS/Coal Input
22	08D	phthalate esters	6.3E-6
22	10C	benzofluoreneamine	6.3E-6
22	78	copper	6.3E-6
25	10C	aminotetralin	5.7E-6
26	49	lead	3.1E-6

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TABLE 6-1. SUMMARY DISCHARGE SEVERITY MEASURES FOR SYNTHETIC FUEL PROCESSES

Process: Kosovo Lurgi — Product Flow Rate: 3.47E0 Nm^3/s (4.41E5 SCF/hr)

Coal Type: Yugoslavian Lignite — Product Heating Value: 1.5E7 J/Nm^3 (4.0E2 Btu/SCF)

Coal Rate (CR): 4.44E3 g/s (1.76E1 T/hr) Energy Production Rate (ER): 5.2E7 J/s (1.8E8 Btu/hr)

Stream	Stream Flow Rate	$\sum$DS	$\sum$WDS	$\sum$WDS/CR	$\sum$WDS/ER	No. Compounds Identified	No. Compounds with DS≥1
Light Oil (Gasoline) Tank Vent	1.9E0 g/s	7.69E4	1.46E5 g/s	3.29E1 g/g	2.81E-3	14	9
Phenolic H_2O Vent	2.3E0 g/s	3.94E4	9.06E4 g/s	2.04E1 g/g	1.74E-3 g/J	19	11
Medium Oil Tank Vent	6.9E-1 g/s	2.82E4	1.94E4 g/s	4.38E0 g/g	3.73E-4 g/J	19	14
Gas to Flare from Tar Separation	9.7E1 g/s	2.43E4	2.36E6 g/s	5.31E2 g/g	4.54E-2 g/J	21	15
Stripper Vent	1.1E2 g/s	2.32E4	2.56E6 g/s	5.76E2 g/g	4 9E-2 g/J	13	7
Autoclave Vent	2.4E1 g/s	1.36E4	3.25E5 g/s	7.33E1 g/g	6.25E-3 g/J	15	6
H_2S from Rectisol	1.9E3 g/s	1.24E4	2.36E7 g/s	5.31E3 g/g	4.53E-1 g/J	18	16
Gas to Flare	5.7E2 g/s	1.04E4	5.92E6 g/s	1.33E3 g/g	1.10E-1 g/J	20	14
Coal Lock Vent (3.2)	6.1E0 g/s	8.61E3	5.25E4 g/s	1.18E1 g/g	2.92E-3 g/J	20	14
Raw Gas to Rectisol	5.1E3 g/s	8.25E3	4.21E4 g/s	9.48E3 g/g	8.10E-4 g/J	20	17
Start Up Vent*	N/A	7.79E3	---	---	---	20	12
Clean Gas from Rectisol	1.4E3 g/s	7.08E3	9.84E6 g/s	2.23E3 g/g	1.89E-1 g/J	14	7
Coal Lock Vent (3.6)	7.1E1 g/s	6.52E3	4.63E5 g/s	1.04E2 g/g	8.90E-3 g/J	19	16

* No flow rate available

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TABLE 6-1 SUMMARY DISCHARGE SEVERITY MEASURES FOR SYNTHETIC FUEL PROCESSES

Process: Kosovo Lurgi - continued Product Flow Rate: _____ (_____)

Coal Type: _____ Product Heating Value: _____ (_____)

Coal Rate (CR): _____ g/s (_____ /hr) Energy Production Rate (ER): _____ J/s (_____ Btu/hr)

Stream	Stream Flow Rate	$\sum$DS	$\sum$WDS	$\sum$WDS/CR	$\sum$WDS/ER	No. Compounds Identified	No. Compounds with DS≧1
Tar Tank Vent	1.4E-4 g/s	4.79E3	8.62E2 g/s	1.94E-1 g/g	1.66E-5 g/J	20	12
H_2S Lean Rectisol	4.0E3 g/s	3.03E3	1.21E7 g/s	2.73E3 g/g	2.32E-1 g/J	11	8
Cyanic Water	2.42E2 g/s	2.44E3	9.31E6 g/s	2.10E3 g/g	1.79E-1 g/J	33	3
Phenosolvan inlet	3.9E3 g/s	2.38E3	9.29E6 g/s	2.09E3 g/g	1.79E-1 g/J	31	7
CO_2 from Rectisol	1.9E3 g/s	2.95E2	5.60E5 g/s	1.26E2 g/g	1.08E-2 g/J	18	10
Phensolvan outlet	3.9E3 g/s	1.09E2	4.25E5 g/s	9.57E1 g/g	8.17E-3 g/J	40	4
Ash Lock Vent	1.3E1 g/s	5.80E1	8.6E0 g/s	1.90E-3 g/g	1.70E-7 g/J	10	3
Coal Handling Vent	2.6E3 g/s	0.00E0	0.00E0 g/s	0.00E0 g/g	0.00E0 g/J	2	0

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TABLE 6-2. ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Description: Light Oil (Gasoline) Tank Vent (15.3) - Discharge

Stream Flow Rate: 1.25E-3 N_m^3/s, _____ ℓ/s, 1.9E0 g/s

Coal Feed Rate (CR): 4.44E3 g/s (1.76E1 tph)

Product Flow Rate: 3.47E0 Nm^3/s (4.41E5 SCFH)

Product Heating Value: 1.5E7 J/Nm^3 (4.0E2 Btu/SCF)

Energy Production Rate (ER): 5.2E7 J/s (1.8E8 Btu/hr)

continued

Table 6-2. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	ethane	trace	--	--	--	--	--
01A	C_3	2.0E5	2.2E-2	4.2E-2	5.6E-2	4.8E-6	12
01A	C_4	1.8E6	1.3E-1	2.5E-1	5.1E-1	4.3E-5	11
01A	C_5	2.6E6	7,3E0	1.4E1	7.3E-1	6.3E-5	7
01A	C_6^+	2.9E8	(4.7E2)	(8.9E2)	8.2E1	7.0E-3	4
13A	methanethiol	5.6E6	5.6E3	1.1E4	1.6E0	1.3E-4	3
13A	ethanethiol	2.7E7	2.7E4	5.1E4	7.6E0	6.5E-4	2
15A	benzene	1.3E8	4.4E4	8.4E4	3.6E1	3.1E-3	1
15A	toluene	7.8E6	2.1E1	4.0E1	2.2E0	1.9E-4	6
15B/A	xylene and ethylbenzene	2.8E5	6.5E-1	1.2E0	7.9E-2	6.7E-6	10
18A	phenols	trace	--	--	--	--	--
42	carbon dioxide	1.7E7	1.9E0	3.6E0	4.8E0	4.1E-4	9
47	hydrogen cyanide	1.3E6	2.6E2	4.9E2	3.7E-1	3.1E-5	5

$\sum DS$ = _____

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

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Table 6-2. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
53	hydrogen sulfide	1.1E5	7.3E0	1.4E1	3.1E-2	2.6E-6	7

$\sum DS$ = 7.69E4 (7.64E4)

$\sum WDS$ = 1.46E5 (1.45E5) g/s

$\sum WDS/CR$ = 3.29E1 (3.27E1) g/g

$\sum WDS/ER$ = 2.81E-3 (2.81E-3) g/J

TABLE 6-3 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Description: Phenolic H_2O Tank Vent (13.7) - Discharge

Stream Flow Rate: 1.5E-3 N m^3/s, ——— t/s, 2.3E0 g/s

Coal Feed Rate (CR): 4.44E3 g/s (1.76E1 tph)

Product Flow Rate: 3.47E0 Nm^3/s (4.41E5 SCFH)

Product Heating Value: 1.5E7 J/Nm^3 (4.0E2 Btu/SCF)

Energy Production Rate (ER): 5.2E7 J/s (1.8E8 Btu/hr)

continued

Table 6-3. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	methane	1.4E6	4.3E-1	9.9E-1	4.7E-1	4.0E-5	15
01A/B	ethane and ethylene	2.7E5	(4.4E-2)	(1.0E-1)	9.1E-2	7.8E-6	16
01A	C_3	3.6E5	4.0E-2	9.2E-2	1.2E-1	1.0E-5	17
01A	C_4	5.2E5	3.7E-1	8.5E-1	1.8E-1	1.5E-5	13
01A	C_5	1.9E5	5.5E-1	1.3E0	6.4E-2	5.5E-6	12
01A	C_6^+	9.7E7	(1.6E2)	(3.7E2)	3.3E1	2.8E-3	6
13A	methanethiol	4.5E6	4.5E3	1.0E4	1.5E0	1.3E-4	3
13A	ethanethiol	2.0E7	2.0E4	4.6E4	6.8E0	5.8E-4	1
15A	benzene	3.8E7	1.3E4	3.0E4	1.3E1	1.1E-3	2
15A	toluene	9.5E6	2.5E1	5.8E1	3.2E0	2.7E-4	9
15B/A	xylene and ethylbenzene	1.3E6	3.1E0	7.1E0	4.4E-1	3.8E-5	11
18A	phenols	trace	--	--	--	--	--

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

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Table 6-3. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
21A	higher aromatics	1.8E4	(3.5E-1)	(8.1E-1)	(6.1E-3)	(5.2E-7)	14
42	carbon dioxide	6.9E8	7.6E1	1.7E1	2.3E2	2.0E-2	7
47	ammonia	9.1E6	5.1E2	1.2E3	3.1E0	2.6E-4	5
47	hydrogen cyanide	4.6E4	9.2E0	2.1E1	1.6E-2	1.3E-6	10
53	hydrogen sulfide	1.9E7	1.3E3	3.0E3	6.4E0	5.5E-4	4
53	carbonyl sulfide	1.1E5	2.9E1	6.7E1	3.7E-2	3.2E-6	8
	hydrogen	trace	--	--	--	--	--

$\sum DS$ = 3.94E4 (3.92E4)

$\sum WDS$ = 9.06E4 (9.02E4) g/s

$\sum WDS/CR$ = 2.04E1 (2.03E1) g/g

$\sum WDS/ER$ = 1.74E-3(1.73E-3) g/J

TABLE 6-4. ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Description: Medium Oil Tank Vent (13.3)- Discharge

Stream Flow Rate: 4.7E-4 N m^3/s, ____ ℓ/s, 6.9E-1 g/s

Coal Feed Rate (CR): 4.44E-3 g/s (1.76E1 tph)

Product Flow Rate: 3.47E0 Nm^3/s (4.41E5 SCFH)

Product Heating Value: 1.5E7 J/Nm^3 (4.0E2 Btu/SCF)

Energy Production Rate (ER): 5.2E7 J/s (1.8E8 Btu/hr)

continued

Table 6-4. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	methane	5.4E7	1.6E1	1.1E1	5.7E0	4.9E-4	9
01A	ethane	4.6E6	7.5E-1	5.2E-1	4.9E-1	4.2E-5	15
01A	C_3	5.9E6	6.5E-1	4.5E-1	6.2E-1	5.4E-5	16
01A	C_4	6.5E6	4.6E0	3.2E0	6.9E-1	5.9E-5	13
01A	C_5	2.9E6	8.3E0	5.7E0	3.1E-1	2.6E-5	12
01A	C_6^+	1.3E8	(2.1E2)	(1.4E2)	1.4E1	1.2E-3	6
01B	ethylene	trace	--	--	--	--	--
13A	methanethiol	1.1E7	1.1E4	7.6E3	1.2E0	1.0E-4	1
13A	ethanethiol	5.8E6	5.8E3	4.0E4	6.1E-1	5.3E-5	3
15A	benzene	2.7E7	8.9E3	6.1E3	2.9E0	2.5E-4	2
15A	toluene	5.8E6	1.5E1	1.0E2	6.1E-1	5.3E-5	10
15B/A	xylene and ethylbenzene	6.6E5	1.5E0	1.0E0	7.0E-2	6.0E-6	14
18A	phenols	1.9E5	9.9E0	6.8E0	2.0E-2	1.7E-6	11

$\sum DS$ = _____

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

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Table 6-4. Continued

MEG Category	Chemical Name	Concentration (µg/m³)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
42	carbon monoxide	7.4E7	1.8E3	1.2E3	7.8E0	6.7E-4	4
42	carbon dioxide	1.1E9	1.2E2	8.3E1	1.2E2	1.0E-2	7
47	ammonia	8.7E3	4.8E-1	3.3E-1	9.2E-4	7.9E-8	17
53	hydrogen sulfide	4.0E6	2.6E2	1.8E2	4.2E-1	3.6E-5	5
53	carbonyl sulfide	2.6E5	6.8E1	4.7E1	2.8E-2	2.4E-6	8
	hydrogen	trace	--	--	--	--	--

$\sum$DS = 2.82E4 (2.80E4)

$\sum$WDS = 1.94E4 (1.93E4) g/s

$\sum$WDS/CR = 4.38E0 (4.35E0) g/g

$\sum$WDS/ER = 3.73E-4 (3.71E-4) g/J

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TABLE6-5. ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Description: Gas to Flare from Tar Separation (13.6) - Process Stream

Stream Flow Rate: 5.6E-2 Nm^3/s, ——— t/s, 9.7E1 g/s

Coal Feed Rate (CR): 4.44E3 g/s (1.76E1 tph)

Product Flow Rate: 3.47E0 Nm^3/s (4.41E5 SCFH)

Product Heating Value: 1.5E7 J/Nm^3 (4.0E2 Btu/SCF)

Energy Production Rate (ER): 5.2E7 J/s (1.8E8 Btu/hr)

continued

Table 6-5. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	methane	2.5E7	7.6E0	7.4E2	3.1E3	2.7E-2	14
01A	ethane	4.4E6	7.2E-1	7.0E1	5.5E1	4.7E-3	19
01A	C_3	8.1E6	8.9E-1	8.6E-1	1.0E2	8.7E-3	18
01A	C_4	1.1E7	7.6E0	7.4E2	1.4E2	1.2E-2	14
01A	C_5	2.9E6	8.3E0	8.1E2	3.6E1	3.1E-3	13
01A	C_6^+	7.0E7	(1.2E2)	(1.2E4)	8.8E2	7.5E-2	8
01B	ethylene	trace	--	--	--	--	--
13A	methanethiol	5.4E6	5.4E3	5.2E5	6.8E1	5.8E-3	2
13A	ethanethiol	4.4E6	4.4E3	4.3E5	5.5E1	4.7E-3	3
15A	benzene	3.4E7	1.1E4	1.1E6	4.3E2	3.6E-2	1
15A	toluene	4.9E6	1.3E1	1.3E3	6.1E1	5.2E-3	12
15B/A	xylene and ethylbenzene	7.1E5	1.6E0	1.6E2	8.9E0	7.6E-4	16
18A	phenols	1.8E4	9.3E-1	9.0E1	2.3E-1	1.9E-5	17

$\sum DS$ = _____

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

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Table 6-5. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
21A	higher aromatics	2.8E4	(5.6E-1)	(5.4E1)	3.5E-1	3.0E-5	20
42	carbon monoxide	1.4E7	3.4E2	3.3E4	1.8E2	1.5E-2	6
42	carbon dioxide	1.5E9	1.7E2	1.6E4	1.9E4	1.6E0	7
47	ammonia	1.5E7	8.1E2	7.9E4	1.9E2	1.6E-2	5
47	hydrogen cyanide	7.8E4	1.6E1	1.6E3	9.6E-1	8.3E-5	11
53	hydrogen sulfide	2.7E7	1.8E3	1.7E5	3.4E2	2.9E-2	4
53	carbonyl sulfide	3.2E5	3.4E1	8.1E3	4.0E0	3.4E-4	9
	hydrogen	9.8E6	2.4E1	2.3E3	1.4E-4	3.1E-6	10

$\sum DS = \frac{2.43E4\ (2.42E4)}{}$

$\sum WDS = \frac{2.36E6\ (2.35E6)\ g/s}{}$

$\sum WDS/CR = \frac{5.31E2\ (5.29E2)\ g/g}{}$

$\sum WDS/ER = \frac{(4.54E-2)\ (4.53E-2)\ g/J}{}$

TABLE 6-6 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Description: Stripper Vent (14.5) - Discharge

Stream Flow Rate: 7.2E-2 Nm^3/s, ——— ℓ/s, 1.1E2 g/s

Coal Feed Rate (CR): 4.44E3 g/s (1.76E1 tph)

Product Flow Rate: 3.47E0 Nm^3/s (4.41E5 SCFH)

Product Heating Value: 1.5E7 J/Nm^3 (4.0E2 Btu/SCF)

Energy Production Rate (ER): 5.2E7 J/s (1.8E8 Btu/hr)

continued

Table 6-6. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					$\mu g/g$ coal	$\mu g/J$ Product	
01A	methane	trace	--	--	--	--	--
01A	ethane	trace	--	--	--	--	--
01A	C_3	trace	--	--	--	--	--
01A	C_4	trace	--	--	--	--	--
01A	C_5	trace	--	--	--	--	--
13A	methanethiol	6.2E5	6.2E2	6.8E4	1.0E1	8.6E-4	5
13A	ethanethiol	2.8E5	2.8E2	3.1E4	4.6E0	3.9E-4	6
15B/A	xylene and ethylbenzene	trace	--	--	--	--	--
18A	phenols	2.6E7	1.4E3	1.5E5	4.2E2	3.6E-2	3
42	carbon dioxide	1.1E9	1.2E2	1.3E4	1.8E4	1.5E0	7
47	ammonia	3.2E8	1.8E4	2.0E6	5.2E3	4.4E-1	1
47	hydrogen cyanide	5.8E6	1.2E3	1.3E5	9.4E2	8.0E-2	4
53	hydrogen sulfide	3.0E7	2.0E3	2.2E5	4.9E2	4.2E-2	2

$\sum DS$ = 2.32E4

$\sum WDS$ = 2.56E6 g/s

$\sum WDS/CR$ = 5.76E2 g/g

$\sum WDS/ER$ = 4.9E-2

Values without supplemental MEG's are the same.

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TABLE 6-7. ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Description: Autoclave Vent (1.2) - Discharge

Stream Flow Rate: 1.6E-2 Nm^3/s, ——— ℓ/s, 2.4E1 g/s

Coal Feed Rate (CR): 4.44E3 g/s (1.76E1 tph)

Product Flow Rate: 3.47E0 Nm^3/s (4.41E5 SCFH)

Product Heating Value: 1.5E7 J/Nm^3 (4.0E2 Btu/SCF)

Energy Production Rate (ER): 5.2E7 J/s (1.8E8 Btu/hr)

continued

Table 6-7. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					$\mu g/g$ coal	$\mu g/J$ Product	
01A	methane	trace	--	--	--	--	--
01A	ethane	trace	--	--	--	--	--
01A	C_3	5.9E5	6.5E-2	1.6E0	2.1E0	1.8E-4	11
01A	C_4	7.8E5	5.5E-1	1.3E1	2.8E0	2.4E-4	8
01A	C_6^+	6.0E5	(9.8E-1)	(2.4E1)	2.2E0	1.8E-4	7
13A	methanethiol	7.3E6	7.3E3	1.8E5	2.6E1	2.2E-3	1
13A	ethanethiol	5.8E6	5.8E3	1.4E5	2.1E1	1.8E-3	2
15A	benzene	5.9E4	2.0E2	4.8E3	2.1E-1	1.8E-5	4
15A	toluene	2.8E4	7.5E-2	1.8E2	1.0E-1	8.6E-6	10
15B/A	xylene and ethylbenzene	1.0E5	2.4E-1	5.8E0	3.6E-1	3.1E-5	9
42	carbon monoxide	trace	--	--	--	--	--
42	carbon dioxide	5.7E8	6.3E1	1.5E3	2.1E3	1.8E-1	5

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

Table 6-7. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
53	hydrogen sulfide	3.7E6	2.4E2	5.8E3	1.3E1	1.1E-3	3
53	carbonyl sulfide	8.0E4	2.1E1	5.0E2	2.9E-1	2.5E-5	6
	hydrogen	trace	--	--	--	--	--

$\sum DS$ = 1.36E4

$\sum WDS$ = 3.25E5 g/s

$\sum WDS/CR$ = 7.33E1 g/g

$\sum WDS/ER$ = 6.25E-3 g/J

Without supplemental MEG values: no difference

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TABLE 6-8. ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Description: H_2S from Rectisol (7.1) - Process Stream

Stream Flow Rate: 1.00E0 Nm^3/s, ——— ℓ/s, 1.9E3 g/s

Coal Feed Rate (CR): 4.44E3 g/s (1.76E1 tph)

Product Flow Rate: 3.47E0 Nm^3/s (4.41E5 SCFH)

Product Heating Value: 1.5E7 J/Nm^3 (4.0E2 Btu/SCF)

Energy Production Rate (ER): 5.2E7 J/s (1.8E8 Btu/hr)

continued

Table 6-8. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	methane	3.1E7	9.2E0	1.7E4	7.0E3	6.0E-1	11
01A	ethane	1.1E7	1.8E0	3.4E3	2.5E3	2.1E-1	14
01A	C_3	1.2E7	1.4E0	2.7E3	2.7E2	2.3E-1	16
01A	C_4	8.3E6	5.9E0	1.1E4	1.9E3	1.6E-1	12
01A	C_5	1.3E6	3.7E0	7.0E3	2.9E2	2.5E-2	13
01A	C_6^+	1.1E7	(1.9E2)	(3.6E4)	2.5E3	2.1E-1	10
01B	ethylene	trace	--	--	--	--	--
13A	methanethiol	4.5E6	4.5E3	8.6E6	1.0E3	8.7E-2	2
13A	ethanethiol	2.2E6	2.2E3	4.2E6	5.0E2	4.2E-2	3
15A	benzene	3.8E5	1.3E2	2.5E5	8.6E1	7.3E-3	7
15A	toluene	3.3E4	8.8E-2	1.7E2	7.4E0	6.3E-4	17
42	carbon monoxide	1.4E7	3.4E2	6.5E5	3.2E3	2.7E-1	4
42	carbon dioxide	1.7E9	1.9E2	3.6E5	3.8E5	3.3E1	6

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

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Table 6-8. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
47	ammonia	1.7E6	9.3E1	1.8E5	3.8E2	3.7E-2	8
47	hydrogen cyanide	2.4E5	4.8E1	9.1E4	5.4E1	4.6E-3	9
53	hydrogen sulfide	6.9E7	4.6E3	8.7E6	1.6E4	1.3E0	1
53	carbonyl sulfide	1.1E6	2.9E2	5.5E5	2.5E2	2.1E-2	5
	hydrogen	6.3E5	1.5E0	2.9E3	1.4E2	1.2E-2	15

$$\sum DS = \frac{1.24E4\ (1.22E4)}{}$$

$$\sum WDS = \frac{2.36E7\ (2.32E7)\ g/s}{}$$

$$\sum WDS/CR = \frac{5.31E3\ (5.22E3)\ g/g}{}$$

$$\sum WDS/ER = \frac{4.53E\text{-}1\ (4.46E\text{-}1)\ g/J}{}$$

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TABLE 6-9 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Description: Gas to Flare (20.1) - Process Stream

Stream Flow Rate:	3.06E-1	Nm^3/s,	t/s, 5.7E2	g/s
Coal Feed Rate (CR):	4.44E3	g/s	(1.76E1	tph)
Product Flow Rate:	3.47E0	Nm^3/s	(4.41E5	SCFH)
Product Heating Value:	1.5E7	J/Nm^3	(4.0E2	Btu/SCF)
Energy Production Rate (ER):	5.2E7	J/s	(1.8E8	Btu/hr)

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Table 6-9. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	methane	4.4E7	1.3E1	7.4E3	3.0E3	2.6E-1	10
01A	ethane	1.0E7	1.7E0	9.7E2	6.9E2	5.9E-2	15
01A	C_3	1.3E7	1.4E0	8.0E2	8.9E2	7.6E-2	16
01A	C_4	9.8E6	7.0E0	4.0E3	6.7E2	5.8E-2	11
01A	C_5	1.3E6	3.7E0	2.1E3	8.9E1	7.6E-3	13
01A	C_6^+	3.2E6	(5.3E0)	(3.0E3)	2.2E2	1.9E-2	12
01B	ethylene	trace	--	--	--	--	--
13A	methanethiol	5.4E6	5.4E3	3.1E6	3.7E2	3.2E-2	1
13A	ethanethiol	5.3E5	5.3E2	3.0E5	3.6E1	3.1E-3	5
15A	benzene	2.2E6	7.4E2	4.2E5	1.5E2	1.3E-2	3
15A	toluene	8.8E5	2.4E0	1.4E3	6.1E1	5.2E-3	14
15B/A	xylene and ethylbenzene	1.6E5	3.6E-1	2.1E2	1.1E1	9.4E-4	17
18A	phenols	trace	--	--	--	--	--

ΣDS = _____

ΣWDS = _____

$\Sigma WDS/CR$ = _____

$\Sigma WDS/ER$ = _____

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Table 6-9. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
42	carbon monoxide	2.4E7	5.9E2	3.4E5	1.7E3	1.4E-1	4
42	carbon dioxide	1.7E9	1.9E2	1.1E5	1.2E5	1.0E1	6
47	ammonia	3.0E6	1.7E2	9.7E4	2.1E2	1.8E-2	8
47	hydrogen cyanide	[illegible]2E5	2.4E1	1.4E4	8.3E0	7.1E-4	9
53	hydrogen sulfide	3.8E7	2.5E3	1.4E6	2.6E3	2.2E-1	2
53	carbonyl sulfide	6.7E5	1.8E2	1.0E5	4.6E1	3.9E-3	7
	hydrogen	trace	--	--	--	--	--

$\sum DS$ = 1.04E4

$\sum WDS$ = 5.92E6 g/s

$\sum WDS/CR$ = 1.33E3 g/g

$\sum WDS/ER$ = 1.1E-1 g/J

Values without supplemental MEG's are the same.

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TABLE 6-10 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Description: Coal Lock Vent (3.2)- Process Stream

Stream Flow Rate: 5.8E-3 Nm^3/s, ____ L/s, 6.1E0 g/s

Coal Feed Rate (CR): 4.44E3 g/s (1.76E1 tph)

Product Flow Rate: 3.47E0 Nm^3/s (4.41E5 SCFH)

Product Heating Value: 1.5E7 J/Nm^3 (4.0E2 Btu/SCF)

Energy Production Rate (ER): 5.2E7 J/s (1.8E8 Btu/hr)

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Table 6-10. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	methane	6.1E7	1.8E1	6.7E-1	8.0E1	6.8E-3	11
01A	ethane	2.9E6	4.8E-1	1.7E-2	3.8E0	3.3E-4	17
01A	C_3	2.8E6	3.1E-1	1.1E-2	3.7E0	3.1E-4	18
01A	C_4	1.3E6	9.2E-1	3.3E-2	1.7E0	1.5E-4	15
01A	C_5	trace	--	--	--	--	--
01A	C_6^+	6.5E6	(1.1E1)	(3.8E-1)	8.5E0	7.3E-4	12
01B	ethylene	trace	--	--	--	--	--
13A	methanethiol	9.0E5	9.0E2	3.2E1	1.2E0	1.0E-4	3
13A	ethanethiol	6.1E5	6.1E2	2.2E1	8.0E-1	6.8E-5	5
15A	benzene	2.6E6	8.8E2	3.2E1	3.4E0	2.9E-4	4
15A	toluene	9.0E5	2.4E0	8.5E-2	1.2E0	1.0E-4	13
15B/A	xylene and ethylbenzene	3.6E5	8.2E-1	2.9E-2	4.7E-1	4.0E-5	16
18A	phenols	2.4E4	1.3E0	4.5E-2	3.1E-2	2.7E-6	14

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

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Table 6-10. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
42	carbon monoxide	1.8E8	4.6E3	2.8E4	2.4E2	2.0E-2	1
42	carbon dioxide	7.2E8	8.0E1	4.9E2	9.5E2	8.1E-2	9
47	ammonia	1.8E6	1.0E2	6.1E2	2.4E0	2.0E-4	7
47	hydrogen cyanide	7.2E5	1.4E2	8.5E2	9.5E-1	8.1E-5	6
53	hydrogen sulfide	1.9E7	1.3E3	7.9E3	2.5E1	2.1E-3	2
53	carbonyl sulfide	3.0E5	7.9E1	4.8E2	3.9E-1	3.4E-5	10
	hydrogen	3.3E7	8.1E1	4.9E2	4.3E1	3.7E-3	8

$\sum DS$ = 8.61E3

$\sum WDS$ = 5.25E4 g/s

$\sum WDS/CR$ = 1.18E1 g/g

$\sum WDS/ER$ = 1.01E-3 g/J

Same without supplemental MEG values

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TABLE 6-11 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Description: Raw Gas to Rectisol (7.3) - Process Stream

Stream Flow Rate: 5.22E0 Nm^3/s, ——— ℓ/s, 5.1E3 g/s

Coal Feed Rate (CR): 4.44E3 g/s (1.76E1 tph)

Product Flow Rate: 3.47E0 Nm^3/s (4.41E5 SCFH)

Product Heating Value: 1.5E7 J/Nm^3 (4.0E2 Btu/SCF)

Energy Production Rate (ER): 5.2E7 J/s (1.8E8 Btu/hr)

continued

Table 6-11. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	methane	8.2E7	2.4E1	1.2E5	9.6E4	8.2E0	10
01A	ethane	6.3E6	1.0E0	5.1E3	7.4E3	6.3E-2	16
01A	C_3	3.7E6	4.1E-1	2.1E3	4.4E3	3.7E-1	18
01A	C_4	1.9E6	1.4E0	7.1E3	2.2E3	1.9E-1	14
01A	C_5	1.4E6	4.0E0	2.0E4	1.6E3	1.4E-1	12
01A	C_6^+	3.5E6	(5.7E0)	(2.9E4)	4.1E3	3.5E-1	11
01B	ethylene	5.9E6	1.0E0	5.1E3	6.9E3	5.9E-1	16
13A	methanethiol	1.3E6	1.3E3	6.6E6	1.5E3	1.3E-1	2
13A	ethanethiol	5.5E5	5.5E2	2.8E6	6.5E2	5.5E-2	5
15A	benzene	2.6E6	8.7E2	4.4E6	3.1E3	2.6E-1	3
15A	toluene	9.5E5	2.5E0	1.3E4	1.1E3	9.5E-2	13
15B/A	xylene and ethylbenzene	4.7E5	1.1E0	5.6E3	5.5E2	4.7E-2	15
18A	phenols	trace	--	--	--	--	--

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

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Table 6-11. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
42	carbon monoxide	1.9E8	4.7E3	2.4E7	2.2E5	1.9E1	1
42	carbon dioxide	6.3E8	7.0E1	3.6E5	7.4E5	6.3E1	8
47	ammonia	2.5E3	1.4E-1	7.1E2	2.9E0	2.5E-4	19
47	hydrogen cyanide	3.9E5	7.8E1	4.0E5	4.6E2	3.9E-2	7
53	hydrogen sulfide	9.1E6	6.1E2	3.1E6	1.1E4	9.1E-1	4
53	carbonyl sulfide	2.6E5	6.8E1	3.5E5	3.1E2	2.6E-1	9
	hydrogen	3.4E7	8.3E1	4.2E5	4.0E4	3.4E0	6

$\sum DS$ = 8.25E3

$\sum WDS$ = 4.21E4 g/s

$\sum WDS/CR$ = 9.48E3 g/g

$\sum WDS/ER$ = 8.10E-4 g/J

Values without supplemental MEG's are the same.

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TABLE 6-12 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Description: Start Up Vent* (Stream 3.3) - Process Stream

Stream Flow Rate: N/A m^3/s, ——— ℓ/s, ——— g/s

Coal Feed Rate (CR): 4.44E3 g/s (1.76E1 tph)

Product Flow Rate: 3.47E0 Nm^3/s (4.41E5 SCFH)

Product Heating Value: 1.5E7 J/Nm^3 (4.0E2 Btu/SCF)

Energy Production Rate (ER): 5.2E7 J/s (1.8E8 Btu/hr)

*No estimate of stream flow rate is available.

continued

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Table 6-12. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	methane	1.1E7	3.5E0				12
01A	ethane	2.0E6	3.3E-1				15
01A	C_3	1.0E6	1.7E-1				16
01A	C_4	7.8E5	5.5E-1				14
01A	C_5	2.3E5	6.4E-1				13
01A	C_6^+	4.9E6	(8.0E0)				11
01B	ethylene	6.2E5	1.1E-1				17
13A	methanethiol	1.1E6	1.1E3				2
13A	ethanethiol	6.7E5	6.7E2				4
15A	benzene	3.1E5	1.0E2				8
15A	toluene	4.1E4	1.1E-1				17
15B/A	xylene and ethylbenzene	trace	--				--
18A	phenols	2.6E6	1.4E2				7

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

Table 6-12. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
42	carbon monoxide	1.8E8	4.4E3				1
42	carbon dioxide	6.7E8	7.4E1				10
47	ammonia	8.4E6	4.7E2				5
47	hydrogen cyanide	3.5E6	7.0E2				3
53	hydrogen sulfide	3.7E6	2.4E2				6
53	carbonyl sulfide	3.0E5	7.9E1				9
	hydrogen	8.0E4	2.0E-1				19

$\sum DS$ = 7.79E3 (7.79E3)

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

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TABLE 6-13 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Kovoso Lurgi

Coal Type: Yugoslavian Lignite

Stream Description: Clean Gas from Rectisol (7.4) - Process Stream

Stream Flow Rate: 3.03E0 Nm^3/s, ——— ℓ/s, 1.4E3 g/s

Coal Feed Rate (CR): 4.44E3 g/s (1.76E1 tph)

Product Flow Rate: 3.47E0 Nm^3/s (4.41E5 SCFH)

Product Heating Value: 1.5E7 J/Nm^3 (4.0E2 Btu/SCF)

Energy Production Rate (ER): 5.2E7 J/s (1.8E8 Btu/hr)

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Table 6-13. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	methane	1.1E8	3.5E1	4.9E4	7.5E4	6.4E0	3
01A	ethane	2.0E6	3.3E-1	4.6E2	1.4E3	1.2E-1	7
01A	C_3	trace	--	--	--	--	--
01A	C_4	trace	--	--	--	--	--
01A	C_5	trace	--	--	--	--	--
01A	C_6^+	1.6E6	(2.7E0)	(3.8E3)	1.1E3	9.3E-2	5
01B	ethylene	trace	--	--	--	--	--
13A	methanethiol	2.4E3	2.4E0	3.4E3	1.6E0	1.4E-4	6
13A	ethanethiol	2.8E3	2.8E0	3.9E3	1.9E0	1.6E-4	4
42	carbon monoxide	2.7E8	6.9E3	9.7E6	1.8E5	1.6E1	1
42	carbon dioxide	3.9E5	4.4E-2	6.2E1	2.7E2	2.3E-2	10
53	hydrogen sulfide	3.3E3	2.2E-1	3.1E2	2.3E0	1.9E-4	8

$\sum DS$ = _____

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

Table 6-13. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
53	carbonyl sulfide	4.6E2	1.2E1	1.7E2	3.1E-1	2.7E-5	9
	hydrogen	5.4E7	1.3E2	1.8E5	3.7E4	3.1E0	2

$\sum DS$ = 7.08E3

$\sum WDS$ = 9.84E6 g/s

$\sum WDS/CR$ = 2.22E3 g/g

$\sum WDS/ER$ = 1.89E-1 g/J

Values without supplemental MEG's are the same.

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TABLE 6-14 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Description: Coal Lock Vent (3.6) - Process Stream

Stream Flow Rate: 6.39E-2 Nm^3/s, ——— l/s, 7.1E1 g/s

Coal Feed Rate (CR): 4.44E3 g/s (1.76E1 tph)

Product Flow Rate: 3.47E0 Nm^3/s (4.41E5 SCFH)

Product Heating Value: 1.5E7 J/Nm^3 (4.0E2 Btu/SCF)

Energy Production Rate (ER): 5.2E7 J/s (1.8E8 Btu/hr)

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Table 6-14. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	methane	7.5E7	2.2E1	1.6E3	1.1E3	9.2E-2	10
01A	ethane	5.6E6	9.2E-1	6.5E1	8.1E1	6.9E-3	14
01A	C_3	4.9E6	5.5E-1	3.9E1	7.1E1	6.0E-3	16
01A	C_4	2.8E6	2.0E0	1.4E2	4.0E1	3.4E-3	12
01A	C_5	3.2E5	9.2E-1	6.5E1	4.6E0	3.9E-4	14
01A	C_6^+	4.3E6	(7.1E0)	5.0E2	6.2E1	5.3E-3	11
01B	ethylene	trace	--	--	--	--	--
13A	methanethiol	9.9E5	9.9E2	7.0E4	1.4E1	1.2E-3	2
13A	ethanethiol	5.8E5	5.8E2	4.1E4	8.3E0	7.1E-4	4
15A	benzene	1.9E6	6.4E2	4.5E4	2.7E1	2.3E-3	3
15A	toluene	4.1E5	1.1E0	7.8E1	5.9E0	5.0E-4	13
15B/A	xylene and ethylbenzene	1.8E5	4.1E-1	2.9E1	2.6E0	2.2E-4	18
18A	phenols	1.1E4	5.5E-1	3.9E1	1.6E-1	1.4E-5	16

$\sum DS$ = _____

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

Table 6-14. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
42	carbon monoxide	1.5E8	3.7E3	2.6E5	2.2E3	1.8E-1	1
42	carbon dioxide	8.3E8	9.2E1	6.5E3	1.2E3	1.0E0	6
47	hydrogen cyanide	2.0E5	4.0E1	2.8E3	2.9E0	2.5E-4	9
53	hydrogen sulfide	5.3E6	3.6E2	2.6E4	7.6E1	6.5E-3	5
53	carbonyl sulfide	3.2E5	8.4E1	6.0E3	4.6E0	3.9E-4	7
	hydrogen	2.9E7	7.0E1	5.0E3	3.8E2	3.3E-2	8

$\sum DS = \frac{6.52E3\ (6.51E3)}{}$

$\sum WDS = \frac{4.63E5\ (4.62E5)\ g/s}{}$

$\sum WDS/CR = \frac{1.04E2\ (1.04E2)\ g/g}{}$

$\sum WDS/ER = \frac{8.90E-3\ (8.90E-3)\ g/J}{}$

TABLE 6-15 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Description: Tar Tank Vent (13.1) - Discharge

Stream Flow Rate: 1.42E-4 Nm^3/s, ——— ℓ/s, 1.8E-1 g/s

Coal Feed Rate (CR): 4.44E3 g/s (1.76E1 tph)

Product Flow Rate: 3.47E0 Nm^3/s (4.41E5 SCFH)

Product Heating Value: 1.5E7 J/Nm^3 (4.0E2 Btu/SCF)

Energy Production Rate (ER): 5.2E7 J/s (1.8E8 Btu/hr)

continued

Table 6-15. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	methane	1.1E6	3.5E-1	6.3E-2	3.5E-2	3.0E-6	13
01A	ethane	trace	--	--	--	--	--
01A	C_3	2.0E5	2.2E-2	4.0E-3	6.4E-3	5.4E-7	15
01A	C_4	trace	--	--	--	--	--
01A	C_5	trace	--	--	--	--	--
01A	C_6^+	2.0E7	(3.3E1)	(5.9E0)	6.4E-1	5.4E-5	7
13A	methanethiol	8.4E5	8.4E2	1.5E2	2.7E-2	2.3E-6	2
13A	ethanethiol	6.7E5	6.7E2	1.2E2	2.1E-2	1.8E-6	4
15A	benzene	7.0E6	2.3E3	4.1E2	2.2E-1	1.9E-5	1
15A	toluene	3.9E6	1.1E1	2.0E0	1.2E-1	1.1E-5	9
15B/A	xylene and ethylbenzene	1.0E6	2.4E0	4.3E-1	3.2E-2	2.7E-6	11
18A	phenols	9.2E4	4.9E0	8.8E-1	2.9E-3	2.5E-7	10

ΣDS = _____ $\Sigma WDS/CR$ = _____

ΣWDS = _____ $\Sigma WDS/ER$ = _____

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Table 6-15. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
21A	higher aromatics	1.3E4	(2.5E-1)	4.5E-2	4.1E-4	3.5E-8	14
42	carbon monoxide	trace	--	--	--	--	--
42	carbon dioxide	1.7E7	1.9E0	3.4E-1	5.4E-1	4.6E-5	12
47	ammonia	2.0E6	1.1E2	2.0E1	6.4E-2	5.4E-6	5
47	hydrogen cyanide	1.6E5	3.2E1	5.8E1	5.1E-3	4.4E-7	8
53	hydrogen sulfide	1.1E7	7.0E2	1.3E2	3.5E-1	3.0E-5	3
53	carbonyl sulfide	3.0E5	7.9E1	1.4E1	9.6E-3	8.2E-7	6
	hydrogen	trace	--	--	--	--	--

$\sum DS$ = 4.79E3 (4.76E3)

$\sum WDS$ = 8.62E2 (8.57E2) g/s

$\sum WDS/CR$ = 1.94E-1 (1.93E-1) g/g

$\sum WDS/ER$ = 1.66E-5 (1.65E-5) g/J

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TABLE 6-16 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Description: Ash Lock Vent (3.5) - Process Stream

Stream Flow Rate: 9.1E-3 Nm^3/s, ——— ℓ/s, 1.3E1 g/s

Coal Feed Rate (CR): 4.44E3 g/s (1.76E1 tph)

Product Flow Rate: 3.47E0 Nm^3/s (4.41E5 SCFH)

Product Heating Value: 1.5E7 J/Nm^3 (4.0E2 Btu/SCF)

Energy Production Rate (ER): 5.2E7 J/s (1.8E8 Btu/hr)

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Table 6-16. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	methane	trace	--	--	--	--	--
01A	ethane	trace	--	--	--	--	--
01A	C_3	trace	--	--	--	--	--
01A	C_4	trace	--	--	--	--	--
01B	ethylene	trace	--	--	--	--	--
18A	phenols	trace	--	--	--	--	--
42	carbon dioxide	2.8E8	3.1E1	4.0E2	5.7E2	4.9E-2	1
47	ammonia	2.6E5	1.4E1	1.8E2	5.3E-1	4.6E-5	2
47	hydrogen cyanide	6.5E4	1.3E1	1.7E2	1.3E-1	1.1E-5	3
53	hydrogen sulfide	1.2E5	8.3E0	1.1E2	2.4E-1	2.1E-5	4

$\sum DS$ = 5.8E1

$\sum WDS$ = 8.6E0 g/s

$\sum WDS/CR$ = 1.9E-3 g/g

$\sum WDS/ER$ = 1.7E-7 g/J

NOTE: No supplemental DMEG's used

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TABLE 6-17 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Description: H_2S Lean Rectisol (7.7) - Process Stream

Stream Flow Rate: 4.53E0 Nm^3/s, ——— ℓ/s, 4.0E3 g/s

Coal Feed Rate (CR): 4.44E3 g/s (1.76E1 tph)

Product Flow Rate: 3.47E0 Nm^3/s (4.41E5 SCFH)

Product Heating Value: 1.5E7 J/Nm^3 (4.0E2 Btu/SCF)

Energy Production Rate (ER): 5.2E7 J/s (1.8E8 Btu/hr)

continued

Table 6-17. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	methane	8.9E7	2.8E1	1.1E5	9.1E3	7.7E0	5
01A	ethane	6.7E6	1.1E0	4.4E3	6.8E3	5.8E-1	8
01A	C_3	9.8E5	1.1E-1	4.4E2	1.0E3	8.5E-2	11
01A	C_6^+	1.4E7	(2.3E1)	(9.2E4)	1.4E4	1.2E0	6
13A	methanethiol	1.4E4	1.4E1	5.6E4	1.4E1	1.2E-3	7
13A	ethanethiol	3.0E4	3.0E1	1.2E5	3.1E1	2.6E-3	4
42	carbon monoxide	1.1E8	2.8E3	1.1E7	1.1E5	9.6E0	1
42	carbon dioxide	6.1E8	6.8E1	2.7E5	6.2E5	5.3E1	3
53	hydrogen sulfide	2.1E3	1.4E-1	5.6E2	2.1E0	1.8E-4	10
53	carbonyl sulfide	1.1E3	2.9E-1	1.2E3	1.1E0	9.6E-5	9
	hydrogen	3.9E7	9.6E1	3.8E5	4.0E4	3.4E0	2

$\sum DS$ = 3.03E3 (2.80E3)

$\sum WDS$ = 1.21E7 (1.12E7) g/s

$\sum WDS/CR$ = 2.73E3 (2.52E3) g/g

$\sum WDS/ER$ = 2.32E-1 (2.15E-1) g/J

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TABLE 6-18 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Description: CO_2 from Rectisol (7.2) - Discharge

Stream Flow Rate: 1.00E0 Nm^3/s, ——— ℓ/s, 1.9E3 g/s

Coal Feed Rate (CR): 4.44E3 g/s (1.76E1 tph)

Product Flow Rate: 3.47E0 Nm^3/s (4.41E5 SCFH)

Product Heating Value: 1.5E7 J/Nm^3 (4.0E2 Btu/SCF)

Energy Production Rate (ER): 5.2E7 J/s (1.8E8 Btu/hr)

continued

Table 6-18. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
01A	methane	8.6E6	2.6E0	4.9E3	1.9E3	1.7E-1	8
01A	ethane	2.1E7	3.5E0	6.7E3	4.7E3	4.0E-1	6
01A	C_3	5.5E6	6.1E-1	1.2E3	1.2E3	1.1E-1	11
01A	C_4	trace	--	--	--	--	--
01A	C_5	trace	--	--	--	--	--
01B	ethylene	trace	--	--	--	--	--
13A	methanethiol	1.8E4	1.8E1	3.4E4	4.1E0	3.5E-4	3
13A	ethanethiol	9.4E3	9.4E0	1.8E4	2.1E0	1.8E-4	4
15A	benzene	3.5E3	1.2E0	2.3E3	7.9E-1	6.7E-5	10
15A	toluene	trace	--	--	--	--	--
15B/A	xylene and ethylbenzene	6.6E3	1.5E-2	2.9E1	1.5E0	1.3E-4	12
42	carbon monoxide	trace	--	--	--	--	--

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

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Table 6-18. Continued

MEG Category	Chemical Name	Concentration ($\mu g/m^3$)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
42	carbon dioxide	1.8E9	2.1E2	4.0E5	4.1E5	3.5E1	1
47	ammonia	3.5E4	1.9E0	3.6E3	7.9E0	6.7E-4	9
47	hydrogen cyanide	1.6E4	3.2E0	6.1E3	3.6E0	3.1E-4	7
53	hydrogen sulfide	5.9E4	4.0E0	7.6E3	1.3E1	1.1E-3	5
53	carbonyl sulfide	1.7E5	4.5E1	8.6E4	3.8E1	3.3E-3	2
	hydrogen	trace	--	--	--	--	--

$\sum DS$ = 2.95E2

$\sum WDS$ = 5.60E5 g/s

$\sum WDS/CR$ = 1.26E2 g/g

$\sum WDS/ER$ = 1.08E-2 g/J

No supplemental MEG values used

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TABLE 6-19 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Description: Cyanic Water (Gas section waste) - process stream

Stream Flow Rate: ____ m^3/s, 2.4E-1 ℓ/s, 2.4E2 g/s

Coal Feed Rate (CR): 4.44E3 g/s (1.76E1 tph)

Product Flow Rate: 3.47E0 Nm^3/s (4.41E5 SCFH)

Product Heating Value: 1.5E7 J/Nm^3 (4.0E2 Btu/SCF)

Energy Production Rate (ER): 5.2E7 J/s (1.8E8 Btu/hr)

continued

Table 6-19. Continued

MEG Category	Chemical Name	Concentration (µg/ℓ)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
27	lithium	2.0E0	6.1E-3	1.5E0	1.1E-4	9.3E-9	8
28	sodium	4.0E3	4.0E-1	9.0E1	2.2E-1	1.9E-5	4
29	potassium	7.0E3	2.3E-1	5.6E1	3.8E-1	3.3E-5	6
30	rubidium	<1.0E0	5.6E-7	1.3E-4	5.4E-5	4.6E-9	33
35	strontium	1.0E1	2.2E-4	5.2E-2	5.4E-4	4.6E-8	27
36	barium	2.0E1	4.0E-3	9.6E-1	1.1E-3	9.3E-8	14
37	boron	2.0E1	4.3E-4	1.0E-1	1.1E-3	9.3E-8	24
38	aluminum	7.0E1	8.8E-4	2.1E-1	3.8E-3	3.3E-7	23
43	silicon	1.0E3	6.7E-3	1.6E0	5.4E-2	4.6E-6	12
44	germanium	2.0E1	2.4E-3	5.7E-1	1.1E-3	9.3E-8	18
46	lead	8.0E0	3.2E-2	7.7E0	4.3E-4	3.7E-8	9
48	phosphorus	3.0E1	2.0E-3	4.8E-1	1.6E-3	1.4E-7	19
49	arsenic	9.0E1	4.5E1	1.1E4	5.0E-3	4.2E-7	1

$\sum DS$ = _____

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

Table 6-19. Continued

MEG Category	Chemical Name	Concentration (µg/ ℓ)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
54	selenium	2.0E1	4.0E-1	9.6E1	1.1E-3	9.3E-8	4
56	fluorine	3.0E2	7.9E-3	1.9E0	1.6E-2	1.4E-6	11
57	chlorine	4.0E3	3.1E-3	7.4E-1	2.2E-1	1.9E-5	17
58	bromine	1.0E2	(7.7E-5)	(1.8E-2)	5.4E-3	4.6E-7	29
59	iodine	4.0E2	(3.1E-4)	(7.4E-2)	2.2E-2	1.9E-6	26
60	scandium	≤2.0E0	2.5E-6	6.0E-4	1.1E-4	9.3E-9	32
61	yttrium	3.0E1	2.0E3	4.8E-1	1.6E-3	1.4E-7	19
62	titanium	4.0E2	4.4E-3	1.1E0	2.2E-2	1.9E-6	13
65	vanadium	1.0E0	4.0E-4	9.6E-2	5.4E-5	4.6E-9	25
68	chromium	9.0E0	1.1E1	2.7E3	4.9E-4	4.2E-8	2
71	manganese	4.0E1	1.6E-1	3.8E1	2.2E-3	1.9E-7	7
72	iron	4.0E3	2.7E0	6.4E2	2.2E-1	1.9E-5	3
74	cobalt	<3.0E0	4.0E-3	9.6E-1	1.6E-4	1.4E-8	14

$\sum DS$ = _____ $\sum WDS/CR$ = _____

$\sum WDS$ = _____ $\sum WDS/ER$ = _____

Table 6-19. Continued

MEG Category	Chemical Name	Concentration (µg/ ℓ)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
76	nickel	7.0E0	2.8E-2	6.7E0	3.8E-4	3.3E-8	10
78	copper	2.0E1	4.0E-3	9.6E-1	1.1E-3	9.3E-8	14
81	zinc	5.0E1	2.0E-3	4.8E-1	2.7E-3	2.3E-7	19
84	cerium	4.0E0	7.3E-6	1.7E-3	2.2E-4	1.9E-8	30
84	lanthenum	8.0E0	4.7E-6	1.1E-3	4.3E-4	3.7E-8	31
85	thorium	≤1.0E1	1.6E-3	3.8E-1	5.4E-4	4.6E-8	22
85	uranium	≤1.0E1	1.7E-4	4.0E-2	5.4E-4	4.6E-8	26

$\sum DS$ = 2.44E3 (2.44E3)

$\sum WDS$ = 9.31E6 (9.31E6) g/s

$\sum WDS/CR$ = 2.10E3 (2.10E3) g/g

$\sum WDS/ER$ = 1.79E-1 (1.79E-1) g/J

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TABLE 6-20 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Description: Phenosolvan inlet - process stream

Stream Flow Rate: _____ m^3/s, 3.9E0 l/s, 3.9E3 g/s

Coal Feed Rate (CR),. 4.44E3 g/s (1.76E1 tph)

Product Flow Rate: 3.47E0 Nm^3/s (4.41E5 SCFH)

Product Heating Value: 1.5E7 J/Nm^3 (4.0E2 Btu/SCF)

Energy Production Rate (ER): 5.2E7 J/s (1.8E8 Btu/hr)

continued

Table 6-20. Continued

MEG Category	Chemical Name	Concentration (µg/ℓ)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
15A	benzene	9.0E2	6.0E-1	2.3E3	7.9E-1	6.7E-5	8
15A	toluene	5.0E2	5.7E-3	2.2E1	4.4E-1	3.7E-5	23
15A	xylene	8.0E2	1.2E-4	4.8E-1	7.0E-1	6.0E-5	29
23A	pyridine	2.8E4	1.2E-1	4.7E2	2.5E1	2.1E-3	11
23A	alkylpyridine	2.6E4	(1.1E-1)	(4.4E2)	2.3E1	1.9E-3	12
23A	2-methyl-pyridine	2.9E4	5.5E-2	2.1E2	2.5E1	2.2E-3	15
23A	3- & 4-methyl-pyridine	1.3E4	2.5E-2	9.6E1	1.1E1	9.7E-4	19
23A	dimethyl pyridine	4.6E4	1.7E-1	6.6E2	4.0E1	3.4E-3	9
23B	quinoline	5.0E3	2.1E-2	8.1E1	4.4E0	3.7E-4	20
23B	alkylquino-line	1.2E4	5.0E-2	2.0E2	1.1E1	9.0E-4	17
32	beryllium	<1.0E0	1.1E-1	4.5E2	8.8E-4	7.5E-8	12

ΣDS = _____

ΣWDS = _____

$\Sigma WDS/CR$ = _____

$\Sigma WDS/ER$ = _____

Table 6-20. Continued

MEG Category	Chemical Name	Concentration (µg/ℓ)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
35	strontium	1.0E2	2.2E-3	8.5E0	8.8E-2	7.5E-6	26
41	thallium	<4.0E0	2.7E-3	1.0E1	3.9E-3	3.0E-7	25
46	lead	1.4E1	5.6E-2	2.2E2	1.2E-2	1.0E-6	14
47	ammonia	3.8E6	1.5E3	5.9E6	3.3E3	2.8E-1	1
47	cyanide	<1.0E3	1.0E0	3.9E3	8.8E-1	7.5E-5	6
47	nitrates	<1.0E3	(7.1E-3)	(2.8E1)	8.8E-1	7.5E-5	22
48	phosphate	<2.5E3	(1.7E-1)	(6.5E2)	2.2E0	1.9E-4	7
49	arsenic	1.0E2	5.0E150	2.0E5	8.8E-2	7.5E-6	5
50	antimony	<2.0E0	2.8E-3	1.1E1	1.8E-3	1.5E-7	24
53	thiocyanate	<7.5E4	(1.5E2)	(5.9E5)	6.6E1	5.6E-3	3
54	selenium	5.0E1	1.0E0	3.9E3	4.4E-2	3.7E-6	6
65	vanadium	<5.0E0	2.0E-3	7.8E0	4.4E-3	3.7E-7	28
68	chromium	<2.3E1	2.9E1	1.1E5	2.0E-2	1.7E-6	4

$\sum$DS = _____

$\sum$WDS = _____

$\sum$WDS/CR = _____

$\sum$WDS/ER = _____

Table 6-20. Continued

MEG Category	Chemical Name	Concentration (µg/ℓ)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
69	molybdenum	<4.0E0	5.3E-5	2.1E-1	3.5E-3	3.0E-7	30
76	nickel	1.3E1	5.2E-2	2.0E2	1.1E-2	9.7E-7	16
78	copper	1.1E1	2.2E-3	8.6E0	9.7E-3	8.2E-7	26
81	zinc	2.8E2	1.1E-2	4.4E1	2.5E-1	2.1E-5	21
82	cadmium	1.4E0	2.8E-2	1.1E2	1.2E-3	1.0E-7	18
83	mercury	6.3E2	6.3E2	2.5E6	5.5E-1	4.7E-5	2
84	cerium	<2.0E0	3.6E-6	1.4E-2	1.8E-3	1.5E-7	31

$\sum DS$ = 2.38E3 (2.23E3)

$\sum WDS$ = 9.29E6 (8.71E6) g/s

$\sum WDS/CR$ = 2.09E3 (1.96E3) g/g

$\sum WDS/ER$ = 1.79E-1 (1.68E-1) g/J

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TABLE 6-21 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Description: Phenosolvan outlet - process stream

Stream Flow Rate: ____ m^3/s, 3.9E0 ℓ/s, 3.9E3 g/s

Coal Feed Rate (CR): 4.44E3 g/s (1.76E1 tph)

Product Flow Rate: 3.47E0 Nm^3/s (4.41E5 SCFH)

Product Heating Value: 1.5E7 J/Nm^3 (4.0E2 Btu/SCF)

Energy Production Rate (ER): 5.2E7 J/s (1.8E8 Btu/hr)

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Table 6-21. Continued

MEG Category	Chemical Name	Concentration (µg/ℓ)	Discharge Severity	Weighted Discharge Severity	Production Factors µg/g coal	Production Factors µg/J Product	Discharge Severity Ranking
27	lithium	3.0E0	9.1E-3	3.5E1	2.6E-3	2.2E-7	19
28	sodium	4.0E3	4.0E-1	1.6E3	3.5E0	3.0E-4	6
29	potassium	1.0E3	3.3E-2	1.3E2	8.8E-1	7.5E-5	15
33	magnesium	2.0E3	2.2E-2	8.7E1	1.8E0	1.5E-4	17
34	calcium	6.0E3	2.5E-2	9.8E1	5.3E0	4.5E-4	16
35	strontium	2.0E1	4.3E-4	1.7E0	1.8E-2	1.5E-6	33
36	barium	5.0E1	1.0E-2	3.9E1	4.4E-2	3.7E-6	18
37	boron	1.0E2	2.1E-3	8.3E0	8.8E-2	7.5E-6	28
38	aluminum	1.0E2	1.3E-3	4.9E0	8.8E-2	7.5E-6	30
43	silicon	1.0E3	6.7E-3	2.6E1	8.8E-1	7.5E-5	20
44	germanium	3.0E1	3.6E-3	1.4E1	2.6E-2	2.2E-6	25
45	tin	9.0E0	3.0E-4	1.2E0	7.9E-3	6.7E-7	35
46	lead	7.0E1	2.8E-1	1.1E3	6.1E-2	5.2E-6	9

ΣOS = _____ $\Sigma WDS/CR$ = _____

ΣWDS = _____ $\Sigma WDS/ER$ = _____

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Table 6-21. Continued

MEG Category	Chemical Name	Concentration (µg/ℓ)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
47	ammonia	2.1E5	8.4E1	3.3E5	1.8E2	1.6E-2	1
47	cyanide	1.9E2	1.9E-1	7.4E2	1.7E-1	1.4E-5	10
47	nitrates	1.1E4	(7.9E-2)	(3.1E2)	9.7E0	8.2E-4	12
48	phosphorus	8.0E1	5.3E-3	2.1E1	7.0E-2	6.0E-6	22
49	arsenic	2.0E1	1.0E1	3.9E4	1.8E-2	1.5E-6	2
53	sulfates	1.1E5	8.5E-2	3.3E2	9.7E1	8.2E-3	11
53	thiocyanate	3.1E3	(6.2E0)	(2.4E4)	2.7E0	2.3E-4	4
56	fluorine	1.0E2	2.6E-3	1.0E1	8.8E-2	7.5E-6	26
57	chlorine	8.0E1	6.2E-5	2.4E-1	7.0E-2	6.0E-6	37
57	chlorides	6.0E4	4.6E-2	1.8E2	5.3E1	4.5E-3	13
58	bromine	9.0E0	(6.9E-6)	(2.7E-2)	7.9E-3	6.7E-7	39
59	iodide	2.0E1	(1.5E-5)	(6.0E-2)	1.8E-2	1.5E-6	38
60	scandium	≤5.0E0	6.3E-2	2.4E-2	4.4E-3	3.7E-7	40

$\sum DS$ = _____

$\sum WDS$ = _____

$\sum WDS/CR$ = _____

$\sum WDS/ER$ = _____

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Table 6-21. Continued

MEG Category	Chemical Name	Concentration (µg/ℓ)	Discharge Severity	Weighted Discharge Severity	Production Factors µg/g coal	Production Factors µg/J Product	Discharge Severity Ranking
61	yttrium	3.0E1	2.0E-3	7.8E0	2.6E-2	2.2E-6	29
62	titanium	2.0E1	2.2E-4	8.7E-1	1.8E-2	1.5E-6	36
63	zirconium	2.0E1	3.5E-4	1.4E0	1.8E-2	1.5E-6	34
65	vanadium	3.0E0	1.2E-3	4.7E0	2.6E-3	2.2E-7	31
68	chromium	5.0E0	6.3E0	2.4E4	4.4E-3	3.7E-7	3
71	manganese	1.0E1	4.0E-2	1.6E2	8.8E-3	7.5E-7	14
72	iron	5.0E2	3.3E-1	1.3E3	4.4E-1	3.7E-5	7
74	cobalt	3.0E0	4.0E-3	1.6E1	2.6E-3	2.2E-7	24
76	nickel	8.0E1	3.2E-1	1.2E3	7.0E-2	6.0E-6	8
78	copper	3.0E1	6.0E-3	2.3E1	2.6E-2	2.2E-6	21
81	zinc	7.0E1	2.8E-3	1.1E1	6.1E-2	5.2E-6	27
85	thorium	<3.0E1	4.8E-3	1.9E1	2.6E-2	2.2E-6	23
85	uranium	<4.0E1	6.7E-4	2.6E0	3.5E-2	3.0E-6	32

$\sum DS$ = 1.09E2 (1.03E2)

$\sum WDS$ = 4.25E5 (4.02E5) g/s

$\sum WDS/CR$ = 9.57E1 (9.05E1) g/g

$\sum WDS/ER$ = 8.17E-3 7.73E-3 g/J

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TABLE 6-22 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Description: Coal Handling Vent (2.2) - Discharge

Stream Flow Rate: 2.00E0 Nm^3/s, ——— ℓ/s, 2.6E3 g/s

Coal Feed Rate (CR): 4.44E3 g/s (1.76E1 tph)

Product Flow Rate: 3.47E0 Nm^3/s (4.41E5 SCFH)

Product Heating Value: 1.5E7 J/Nm^3 (4.0E2 Btu/SCF)

Energy Production Rate (ER): 5.2E7 J/s (1.8E8 Btu/hr)

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Table 6-22. Continued

HEG Category	Chemical Name	Concentration (µg/m³)	Discharge Severity	Weighted Discharge Severity	Production Factors		Discharge Severity Ranking
					µg/g coal	µg/J Product	
18A	phenol	trace	--	--	--	--	--
53	carbonyl sulfide	trace	--	--	--	--	--

$\sum DS = \frac{0.0EO}{(0.0EO)}$

$\sum WDS = \frac{0.0EO}{(0.0EO)}$

$\sum WDS/CR = \frac{0.0EO}{(0.0EO)}$

$\sum WDS/ER = \frac{0.0EO}{(0.0EO)}$

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TABLE 6-23 RANKING OF COMPOUNDS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Kosovo Lurgi
Stream Description: Light Oil (Gasoline) Tank Vent (15.3)
Coal Type: Yugoslavian Lignite
Stream Flow Rate: 1.9E0 g/s
Stream Type: Gaseous

Ranking	MEG Category	Compound	Discharge Severity Order of Magnitude
1	15A	benzene	10,000
2	13A	ethanethiol	10,000
3	13A	methanethiol	10,000
4*	01A	C_6^+	100
5	47	hydrogen cyanide	100
5*	47	nitrogen	100
7	15A	toluene	10
8	01A	C_5	10
8	53	hydrogen sulfide	10
10	42	carbon dioxide	1
11	15B/A	xylene + ethylbenzene	1

*Based on supplemental MEG values

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TABLE6-24 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Kosovo Lurgi — Stream Description: Phenolic H_2O Vent Tank (13.7)

Coal Type: Yugoslavian Lignite — Stream Flow Rate: 2.3E0 g/s

Stream Type: Gaseous

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	13A	ethanethiol	10,000
2	15A	benzene	10,000
3	13A	methanethiol	1,000
4	53	hydrogen sulfide	1,000
5	47	ammonia	1,000
6*	01A	C_6^+	100
7	42	carbon dioxide	100
8	53	carbonyl sulfide	10
9	15A	toluene	10
10	47	hydrogen cyanide	10
11	15B/A	xylene + ethylbenzene	1
12	01A	C_5	1

*Based on supplemental MEG values

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TABLE 6-25 RANKING OF COMPOUNDS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Kosovo Lurgi Stream Description: Medium Oil Tank Vent (13.3)

Coal Type: Yugoslavian Lignite Stream Flow Rate: 6.9E-1 g/s

Stream Type: Gaseous

Ranking	MEG Category	Compound	Discharge Severity Order of Magnitude
1	13A	methanethiol	10,000
2	15A	benzene	10,000
3	13A	ethanethiol	10,000
4	42	carbon monoxide	1,000
5	53	hydrogen sulfide	100
6*	01A	C_6^+	100
7	42	carbon dioxide	100
8	53	carbonyl sulfide	100
9	01A	methane	10
10	15A	toluene	10
11	18A	phenols	10
12	01A	C_5	10
13	01A	C_4	1
14	15B/A	xylene + ethylbenzene	1
15	01A	ethane	1
16	01A	C_3	1
17	47	ammonia	1

*Based on supplemental MEG values

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TABLE 6-26. RANKING OF COMPOUNDS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Kosovo Lurgi
Stream Description: Gas to Flare from Tar Separation (13.6)
Coal Type: Yugoslavian Lignite
Stream Flow Rate: 9.2E1 g/s
Stream Type: Gaseous

Ranking	MEG Category	Compound	Discharge Severity Order of Magnitude
1	15A	benzene	10,000
2	13A	methanethiol	10,000
3	13A	ethanethiol	1,000
4	53	hydrogen sulfide	1,000
5	47	ammonia	1,000
6	42	carbon monoxide	100
7	42	C_6^+	100
8	42	carbon dioxide	100
9	53	carbonyl sulfide	100
10	15A	toluene	10
11	01A	C_5	10
12	01A	C_4	10
13	01A	methane	10
14	47	hydrogen cyanide	1
15	15B/A	xylene + ethylbenzene	1
16	18A	phenols	1
17	01A	C_3	1
18	01A	ethane	1
19*	21A	higher aromatics	1

*Based on supplemental MEG values

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TABLE 6-27 RANKING OF COMPOUNDS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Kosovo Lurgi Stream Description: Stripper Vent (14.5)

Coal Type: Yugoslavian Lignite Stream Flow Rate: 1.1E2 g/s

Stream Type: Gaseous

Ranking	MEG Category	Compound	Discharge Severity Order of Magnitude
1	47	ammonia	10,000
2	53	hydrogen sulfide	1,000
3	18A	phenols	1,000
4	47	hydrogen cyanide	1,000
5	13A	methanethiol	1,000
6	13A	ethanethiol	100
7	42	carbon dioxide	100

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TABLE6-28 RANKING OF COMPOUNDS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Kosovo Lurgi Stream Description: Autoclave Vent (1.2)

Coal Type: Yugoslavian Lignite Stream Flow Rate: 2.4E1 g/s

Stream Type: Gaseous

Ranking	MEG Category	Compound	Discharge Severity Order of Magnitude
1	13A	methanethiol	10,000
2	13A	ethanethiol	10,000
3	53	hydrogen sulfide	100
4	15A	benzene	100
5	53	carbonyl sulfide	10
6*	01A	C_6^+	1
7	01A	C_4	1

*Based on supplemental MEG values

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TABLE 6-29 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Kosovo Lurgi Stream Description: H_2S from Rectisol (7.1)

Coal Type: Yugoslavian Lignite Stream Flow Rate: 1.9E3 g/s

Stream Type: Gaseous

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	53	hydrogen sulfide	1,000
2	13A	methanethiol	1,000
3	13A	ethanethiol	1,000
4	42	carbon monoxide	100
5	53	carbonyl sulfide	100
6	42	carbon dioxide	100
7	15A	benzene	100
8	47	ammonia	100
9	47	hydrogen cyanide	10
10*	01A	C_6^+	10
11	01A	methane	10
12	01A	C_4	10
13	01A	C_5	1
14	01A	ethane	1
15	01A	C_3	1

*Based on supplemental MEG values

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TABLE 6-30 RANKING OF COMPOUNDS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Kosovo Lignite Stream Description: Gas to Flare (20.1)

Coal Type: Yugoslavian Lignite Stream Flow Rate: 5.7E2 g/s

Stream Type: Gaseous

Ranking	MEG Category	Compound	Discharge Severity Order of Magnitude
1	13A	methanethiol	10,000
2	53	hydrogen sulfide	1,000
3	15A	benzene	1,000
4	42	carbon monoxide	1,000
5	13A	ethanethiol	1,000
6	42	carbon dioxide	100
7	53	carbonyl sulfide	100
8	47	ammonia	100
9	47	hydrogen cyanide	10
10	01A	methane	10
11	01A	C_4	10
12*	01A	C_6^+	10
13	01A	C_5	1
14	15A	toluene	1
15	01A	ethane	1
16	01A	C_3	1

*Based on supplemental MEG values

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TABLE 6-31 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Kosovo Lurgi Stream Description: Coal Lock Vent (3.2)

Coal Type: Yugoslavian Lignite Stream Flow Rate: 6.1E0 g/s

Stream Type: Gaseous

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	42	carbon monoxide	1,000
2	53	hydrogen sulfide	1,000
3	13A	methanethiol	1,000
4	15A	benzene	1,000
5	13A	ethanethiol	1,000
6	47	hydrogen cyanide	100
7	47	ammonia	100
8	---	hydrogen	100
9	42	carbon dioxide	100
10	53	carbonyl sulfide	100
11	01A	methane	10
12*	01A	C_6^+	10
13	15A	toluene	1
14	18A	phenols	1
15	01A	C_4	1
16	15B/A	xylene + ethylbenzene	1

* Based on supplemental MEG values

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TABLE 6-32 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Kosovo Lurgi — Stream Description: Raw Gas to Rectisol (7.3)

Coal Type: Yugoslavian Lignite — Stream Flow Rate: 5.1E3 g/s

Stream Type: Gaseous

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	42	carbon monoxide	1,000
2	13A	methanethiol	1,000
3	15A	benzene	1,000
4	53	hydrogen sulfide	1,000
5	53	ethanethiol	1,000
6	---	hydrogen	100
7	47	hydrogen cyanide	100
8	42	carbon dioxide	100
9	53	carbonyl sulfide	100
10	01A	methane	10
11*	01A	C_6^+	10
12	01A	C_5	1
13	15A	toluene	1
14	01A	C_4	1
15	15B/A	xylene + ethylbenzene	1
16	01A	ethane	1
16	01B	ethylene	1

* Based on supplemental MEG values

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TABLE 6-33 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Kosovo Lurgi Stream Description: Start Up Vent (3.3)

Coal Type: Yugoslavian Lignite Stream Flow Rate: Not Available

Stream Type: Gaseous

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	42	carbon monoxide	1,000
2	13A	methanethiol	1,000
3	47	hydrogen cyanide	1,000
4	13A	ethanethiol	1,000
5	47	ammonia	100
6	53	hydrogen sulfide	100
7	18A	phenols	100
8	15A	benzene	100
9	53	carbonyl sulfide	100
10	42	carbon dioxide	100
11*	01A	C_6^+	10
12	01A	methane	1
13	01A	C_5	1
14	01A	C_4	1

*Based on supplemental MEG values

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TABLE 6-34 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Kosovo Lurgi Stream Description: Clean Gas from Rectisol (7.4)

Coal Type: Yugoslavian Lignite Stream Flow Rate: 1.4E3 g/s

Stream Type: Gaseous

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	42	carbon monoxide	10,000
2	---	hydrogen	100
2	01A	methane	100
4	13A	ethanethiol	1
5*	01A	C_6^+	1
6	13A	methanethiol	1

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* Based on supplemental MEG values

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TABLE 6-35 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Kosovo Lurgi | Stream Description: Coal Lock Vent (3.6)

Coal Type: Yugoslavian Lignite | Stream Flow Rate: 7.1E1 g/s

Stream Type: Gaseous

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	42	carbon monoxide	1,000
2	13A	methanethiol	1,000
3	15A	benzene	1,000
4	13A	ethanethiol	1,000
5	53	hydrogen sulfide	100
6	42	carbon dioxide	100
7	53	carbonyl sulfide	100
8	---	hydrogen	100
9	47	hydrogen cyanide	10
10	01A	methane	10
11*	01A	C_6^+	10
12	01A	C_4	1
13	15A	toluene	1
14	01A	C_5	1
15	01A	ethane	1
16	01A	C_3	1
16	18A	phenols	1

* Based on supplemental MEG values

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TABLE 6-36 RANKING OF COMPOUNDS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Kosovo Lurgi Stream Description: Tar Tank Vent (13.1)

Coal Type: Yugoslavian Lignite Stream Flow Rate: 1.4E-1 g/s

Stream Type: Gaseous

Ranking	MEG Category	Compound	Discharge Severity Order of Magnitude
1	15A	benzene	1,000
2	13A	methanethiol	1,000
3	53	hydrogen sulfide	1,000
4	13A	ethanethiol	1,000
5	47	ammonia	100
6	53	carbonyl sulfide	100
7*	01A	C_6^+	10
8	47	hydrogen cyanide	10
9	15A	toluene	10
10	18A	phenols	1
11	15B/A	xylene + ethylbenzene	1
12	42	carbon dioxide	1

*Based on supplemental MEG values

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TABLE6-37 RANKING OF COMPOUNDS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Kosovo Lurgi Stream Description: Ash Lock Vent (3.5)

Coal Type: Yugoslavian Lignite Stream Flow Rate: 1.3E1 g/s

Stream Type: Gaseous

Ranking	MEG Category	Compound	Discharge Severity Order of Magnitude
1	42	carbon dioxide	1,000
2	47	ammonia	10
3	47	hydrogen cyanide	10
4	53	hydrogen sulfide	10

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TABLE 6-38 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Kosovo Lurgi Stream Description: H_2S Lean Rectisol (7.7)

Coal Type: Yugoslavian Lignite Stream Flow Rate: 4.0E3 g/s

Stream Type: Gaseous

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	42	carbon monoxide	1,000
2	---	hydrogen	100
3	42	carbon dioxide	100
4	13A	ethanethiol	10
5	01A	methane	10
6*	01A	C_6^+	10
7	13A	methanethiol	10
8	01A	ethane	1

* Based on supplemental MEG values

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TABLE 6-39 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Kosovo Lurgi Stream Description: CO_2 from Rectisol (7.2)

Coal Type: Yugoslavian Lignite Stream Flow Rate: 1.9E3 g/s

Stream Type: Gaseous

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	42	carbon dioxide	100
2	53	carbonyl sulfide	10
3	13A	methanethiol	10
4	13A	ethanethiol	10
5	53	hydrogen sulfide	1
6	01A	ethane	1
7	01A	methane	1
8	47	hydrogen cyanide	1
9	47	ammonia	1
10	15A	benzene	1
11	01A	C_3	1

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TABLE 6-40 RANKING OF POLLUTANTS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Kosovo Lurgi Stream Description: Cyanic water

Coal Type: Yugoslavian Lignite Stream Flow Rate: 2.4E2 g/s

Stream Type: Liquid

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	49	arsenic	10
2	68	chromium	10
3	72	iron	1

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TABLE 6-41 RANKING OF POLLUTANTS VIA DISCHARGE SEVERITY BY PHASE

Process: Kosovo Lurgi Stream Description: Phenosolvan inlet

Coal Type: Yugoslavian Lignite Stream Flow Rate: 3.9E3 g/s

Stream Type: Liquid

Ranking	MEG Category	POLLUTANT	Discharge Severity Order of Magnitude
1	47	ammonia	1000
2	83	mercury	1000
3*	53	thiocyanate	100
4	49	arsenic	100
5	68	chromium	10
6	47	cyanide	1
6	54	selenium	1

* Based on supplemental MEG value.

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TABLE 6-42 RANKING OF POLLUTANTS VIA DISCHARGE SEVERITY BY PHASE

Process: Kosovo Lurgi
Stream Description: Phenosolvan outlet -
Coal Type: Yugoslavian Lignite
Stream Flow Rate: 3.9E3 g/s
Stream Type: Liquid

Ranking	MEG Category	POLLUTANT	Discharge Severity Order of Magnitude
1	47	ammonia	100
2	49	arsenic	10
3	68	chromium	10
4*	53	thiocyanate	10

* Based on supplemental MEG values.

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TABLE 6-43 RANKING OF COMPOUNDS IN EFFLUENT VIA DISCHARGE SEVERITY

Process: Kosovo Lurgi Stream Description: Coal Handling Vent (2.2)

Coal Type: Yugoslavian Lignite Stream Flow Rate: 2.6E3 g/s

Stream Type: Gaseous

Ranking	MEG Category	Compound	Discharge Severity Order of Magnitude
		NOTE: No Pollutants found with DS>1	

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TABLE 6-44 RANKING OF POLLUTANTS VIA WEIGHTED DISCHARGE SEVERITY BY PHASE

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Type: Liquid

Ranking	MEG Category	Pollutant	Discharge Severity Order of Magnitude
1	47	ammonia	1000
2	83	mercury	1000
3	49	arsenic	100
4	68	chromium	10
5	72	iron	1
6	47	cyanide	1
6	54	selenium	1

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TABLE 6-45 RANKING OF POLLUTANTS VIA DISCHARGE SEVERITY BY PHASE

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Type: Gaseous

Ranking	MEG Category	POLLUTANT	Discharge Severity Order of Magnitude
1	15A	benzene	10,000
2	13A	ethanethiol	10,000
3	47	ammonia	10,000
4	13A	methanethiol	10,000
5	42	carbon monoxide	10,000
6	53	hydrogen sulfide	1,000
7	42	carbon dioxide	1,000
8	18A	phenols	1,000
9	47	hydrogen cyanide	1,000
10*	01A	C_6^+	100
11	53	carbonyl sulfide	100
12	01A	methane	10
13	15A	toluene	10
14	01A	C_5	10
15	01A	C_4	10
16	01A	ethane	1
17	15B/A	xylene + ethylbenzene	1
18	01A	C_3	1
19	01B	ethylene	1
20*	21A	higher aromatics	1

*Based on supplemental MEG values

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TABLE 6-46 RANKING OF POLLUTANTS VIA WEIGHTED DISCHARGE SEVERITY BY PHASE

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Type: Liquid

Ranking	MEG Category	Pollutant	WDS/Coal Input
1	47	ammonia	1.5E0 g/J
2	83	mercury	6.5E-1
3	49	arsenic	5.2E-2
4	68	chromium	2.9E-2
5	47	cyanide	6.3E-3
6	54	selenium	1.0E-3
7	72	iron	3.4E-4

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TABLE 6-47. RANKING OF POLLUTANTS VIA DISCHARGE SEVERITY BY PHASE

Process: Kosovo Lurgi

Coal Type: Yugoslavian Lignite

Stream Type: Gaseous

Ranking	MEG Category	POLLUTANT	Discharge Severity Order of Magnitude
1	42	carbon monoxide	6.3E0 g/J
2	53	hydrogen sulfide	2.3E0
3	13A	methanethiol	2.3E0
4	15A	benzene	1.2E0
5	13A	ethanethiol	1.1E0
6	47	ammonia	5.2E-1
7	53	carbonyl sulfide	1.4E-1
8	---	hydrogen	1.1E-1
9	42	carbon dioxide	1.0E-1
9	47	hydrogen cyanide	1.0E-1
11	18A	phenols	3.9E-2
12	01A	methane	3.1E-2
13	01A	C_5	5.2E-3
14	15A	toluene	3.4E-3
15	01A	C_4	2.9E-3
16	01A	ethane	1.8E-3
17	15B/A	xylene + ethylbenzene	1.5E-3
18	01B	ethylene	1.3E-3
19	01A	C_3	7.1E-4

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TABLE 7-1. SUMMARY DISCHARGE SEVERITY MEASURES FOR SYNTHETIC FUEL PROCESSES

Process: RTI #21 — Product Flow Rate: 1.76E-4 Nm^3/s (2.24E1 SCF/hr)

Coal Type: Illinois #6 — Product Heating Value: 7.41E6 J/Nm^3 (199 Btu/SCF)

Coal Rate (CR): 6.78E-2 g/s (2.69E-4 T/hr) Energy Production Rate (ER): 1310 J/s (4470 Btu/hr)

Stream	Stream Flow Rate	$\sum$ DS	$\sum$ WDS	$\sum$ WDS/CR	$\sum$ WDS/ER	No. Compounds Identified	No. Compounds with DS≧1
Gas	1.1E-1g/s	5.4E3	5.8E2 g/s	8.6E3 g/g	4.4E-1 g/J	32	13
Condensate	1.5E-5 g/s	4.1E4	6.2E3 g/s	9.1E4 g/g	4.7E0 g/J	16	11
Tar	2.2E-3 g/s	8.8E4	2.0E2 g/s	2.9E3 g/g	1.5E-1 g/J	39	13
Ash	9.3E-3 g/s	1.6E3	1.5E1 g/s	2.2E2 g/g	1.1E-2 g/J	8	3

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TABLE 7-2. ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #21

Coal Type: Illinois #6

Stream Description: Gas (Product)

Stream Flow Rate: 1.76E-4 Nm^3/s, ____ ℓ/s, 1.1E-1 g/s

Coal Feed Rate (CR): 6.78E-2 g/s (2.69E-4 tph)

Product Flow Rate: 1.76E-4 Nm^3/s (2.24E1 SCFH)

Product Heating Value: 7.41E6 J/Nm^3 (199 Btu/SCF)

Energy Production Rate (ER): 1310 J/s (4470 Btu/hr)

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Table 7.2 RTI RUN NUMBER - 21 STREAM - GAS

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	PRODUCTION FACTORS UG/J PRODUCT	DS RANK
01A	METHANE	3.6E+07	1.1E+01	1.2E+00	9.4E+04	4.9E+00	7.0
01A	ETHANE	1.3E+06	2.1E-01	2.2E-02	3.4E+03	1.8E-01	18.0
01A	PROPANE	1.6E+05	1.8E-02	1.9E-03	4.2E+02	2.2E-02	29.0
01A	N-BUTANE	6.5E+04	4.6E-02	4.9E-03	1.7E+02	8.8E-03	23.5
01A	ISOBUTANE	6.5E+04	4.6E-02	4.9E-03	1.7E+02	8.8E-03	23.5
01B	ETHYLENE	9.4E+05	1.6E-01	1.8E-02	2.4E+03	1.3E-01	22.0
01B	PROPYLENE	1.9E+05	2.2E-02	2.4E-03	4.9E+02	2.6E-02	27.0
01C	ACETYLENE	1.2E+04	4.4E-03	4.7E-04	3.1E+01	1.6E-03	30.0
13A	METHANETHIOL	1.7E+04	1.7E+01	1.8E+00	4.4E+01	2.3E-03	6.0
15A	ETHYLBENZENE	8.8E+04	2.0E-01	2.1E-02	2.3E+02	1.2E-02	20.0
15A	XYLENES	8.8E+04	2.0E-01	2.1E-02	2.3E+02	1.2E-02	20.0
15A	BIPHENYL	1.9E+03	1.9E+00	2.0E-01	4.9E+00	2.6E-04	14.0
15A	DIPHENYLMETHANE	3.1E+02	(3.1E-01)	(3.3E-02)	(8.1E-01)	(4.2E-05)	17.0
15B	INDAN	4.9E+03	2.1E-02	2.3E-03	1.3E+01	6.6E-04	28.0
15B	INDENE	1.9E+03	4.2E-02	4.5E-03	4.9E+00	2.6E-04	25.0
15B	XYLENES	8.8E+04	2.0E-01	2.1E-02	2.3E+02	1.2E-02	20.0
18A	PHENOL	2.8E+04	1.5E+00	1.6E-01	7.3E+01	3.8E-03	15.0
18A	CRESOLS	6.9E+04	3.1E+00	3.3E-01	1.8E+02	9.3E-03	12.0
18A	XYLENOLS	6.9E+04	5.3E+00	5.7E-01	1.8E+02	9.3E-03	9.0
21A	NAPHTHALENE	1.7E+05	3.4E+00	3.6E-01	4.4E+02	2.3E-02	10.0
21A	ANTHRACENE	1.6E+03	2.9E-02	3.0E-03	4.2E+00	2.2E-04	26.0
21A	PHENANTHRENE	6.9E+02	4.3E-01	4.6E-02	1.8E+00	9.3E-05	16.0
24A	BENZOFURAN	2.1E+04	4.0E-03	4.2E-04	5.5E+01	2.8E-03	31.0
24B	DIBENZOFURAN	9.8E+03	1.8E-03	2.0E-04	2.5E+01	1.3E-03	32.0
25A	THIOPHENE	1.2E+05	2.7E+01	2.8E+00	3.1E+02	1.6E-02	5.0
25A	C2-THIOPHENES	7.8E+04	(3.0E+00)	(3.2E-01)	(2.0E+02)	(1.1E-02)	13.0
42B	CARBON MONOXIDE	1.9E+08	4.8E+03	5.1E+02	4.9E+05	2.6E+01	1.0
42B	CARBON DIOXIDE	3.4E+08	3.8E+01	4.0E+00	8.8E+05	4.6E+01	4.0
53B	HYDROGEN SULFIDE	7.6E+06	5.1E+02	5.4E+01	2.0E+04	1.0E+00	2.0
53C	CARBONYL SULFIDE	4.0E+04	1.1E+01	1.1E+00	1.0E+02	5.4E-03	8.0
53D	CARBON DISULFIDE	1.0E+04	3.3E+00	3.6E-01	2.6E+01	1.3E-03	11.0
99A	HYDROGEN	2.7E+07	(6.6E+01)	(7.0E+00)	(7.0E+04)	(3.6E+00)	3.0

SUM OF DS INCLUDING ALL COMPOUNDS = 5.4E+03
SUM OF DS EXCLUDING SOME COMPOUNDS= 5.4E+03

SUM OF WDS INCLUDING ALL COMPOUNDS =5.8E+02
SUM OF WDS EXCLUDING SOME COMPOUNDS=5.7E+02

SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 8.6E+03
SUM OF WDS/CR EXCLUDING SOME COMPOUNDS= 8.5E+03

SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 4.4E-01
SUM OF WDS/ER EXCLUDING SOME COMPOUNDS= 4.4E-01

TABLE 7-3 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #21

Coal Type: Illinois #6

Stream Description: Condensate (Discharge)

Stream Flow Rate: _____ m^3/s, 1.49E-4 ℓ/s, 1.49E-1 g/s

Coal Feed Rate (CR): 6.78E-2 g/s (2.69E-4 tph)

Product Flow Rate: 1.76E-4 Nm^3/s (2.2E1 SCFH)

Product Heating Value: 7.41E6 J/Nm^3 (199 Btu/SCF)

Energy Production Rate (ER): 1310 J/s (4470 Btu/hr)

continued

Table 7.3 RTI RUN NUMBER - 21 STREAM - CONDENSATE

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
18A	PHENOL	4.7E+04	2.8E+00	4.1E-01	1.0E+02	5.4E-03	10.0
18A	CRESOLS	1.1E+05	2.2E+04	3.3E+03	2.4E+02	1.3E-02	1.0
18A	XYLENOLS	6.8E+04	1.4E+04	2.0E+03	1.5E+02	7.8E-03	2.0
18A	TRIMETHYLPHENOL	1.8E+04	3.6E+03	5.4E+02	4.0E+01	2.1E-03	3.0
46A	LEAD	3.0E+01	1.2E-01	1.8E-02	6.6E-02	3.4E-06	13.0
47A	NITRATES	1.0E+01	7.1E-05	1.1E-05	2.2E-02	1.1E-06	16.0
47A	CYANIDE	3.5E+03	3.5E+00	5.2E-01	7.7E+00	4.0E-04	8.0
47B	AMMONIA	4.0E+06	1.6E+03	2.4E+02	8.8E+03	4.6E-01	4.0
48A	PHOSPHORUS	1.0E+02	6.7E-03	9.9E-04	2.2E-01	1.1E-05	14.0
49A	ARSENIC	2.3E+02	1.2E+02	1.7E+01	5.1E-01	2.6E-05	6.0
53A	SULFUR	5.7E+05	2.8E+00	4.2E-01	1.3E+03	6.5E-02	9.0
53A	THIOCYANATE	2.7E+05	3.1E+01	4.6E+00	5.9E+02	3.1E-02	7.0
50A	ANTIMONY	3.5E+00	4.8E-03	7.1E-04	7.7E-03	4.0E-07	15.0
57A	CHLORIDES	2.2E+06	1.7E+00	2.5E-01	4.8E+03	2.5E-01	11.0
68A	CHROMIUM	2.9E+02	3.6E+02	5.4E+01	6.4E-01	3.3E-05	5.0
82A	CADMIUM	3.8E+00	7.6E-01	1.1E-01	8.4E-03	4.3E-07	12.0

SUM OF DS INCLUDING ALL COMPOUNDS = 4.1E+04 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 9.1E+04

SUM OF WDS INCLUDING ALL COMPOUNDS =6.2E+03 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 4.7E+00

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TABLE 7-4 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #21

Coal Type: Illinois #6

Stream Description: Tar (Byproduct)

Stream Flow Rate: ____ m^3/s, 2.24E-6 ℓ/s, 2.2E-3 g/s

Coal Feed Rate (CR): 6.78E-2 g/s (2.69E-4 tph)

Product Flow Rate: 1.76E-4 Nm^3/s (22.4 SCFH)

Product Heating Value: 7.41E6 J/Nm^3 (199 Btu/SCF)

Energy Production Rate (ER): 1310 J/s (4470 Btu/hr)

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Table 7.4 RTI RUN NUMBER - 21 STREAM - TAR

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	PRODUCTION FACTORS UG/J PRODUCT	DS RANK
10C	ANILINE	2.7E+02	4.5E-03	1.0E-05	8.9E+00	4.6E-04	38.0
10C	BENZIDINE	5.0E+02	1.7E-01	3.7E-04	1.7E+01	8.6E-04	21.0
15A	BIPHENYL	2.6E+03	8.7E-01	1.9E-03	8.6E+01	4.5E-03	14.0
18A	PHENOL	2.9E+03	8.5E-01	1.9E-03	9.6E+01	5.0E-03	15.0
18A	CRESOLS	1.1E+04	1.1E+04	2.5E+01	3.6E+02	1.9E-02	2.0
18A	XYLENOLS	2.7E+03	2.7E+03	6.1E+00	8.9E+01	4.6E-03	5.0
21A	NAPHTHALENE	5.7E+04	3.8E-01	8.5E-04	1.9E+03	9.8E-02	18.0
21A	C2-(ALKYL)NAPHTHALENE	1.1E+04	1.6E-02	3.6E-05	3.6E+02	1.9E-02	30.0
21A	1-METHYLNAPHTHALENE	3.3E+03	4.9E-03	1.1E-05	1.1E+02	5.7E-03	37.0
21A	2-METHYLNAPHTHALENE	1.0E+04	1.5E-02	3.3E-05	3.3E+02	1.7E-02	31.0
21A	ACENAPHTHYLENE	1.2E+04	(2.5E+00)	(5.6E-03)	(4.0E+02)	(2.1E-02)	11.0
21A	ACENAPHTHENE	3.8E+03	(7.9E-01)	(1.8E-03)	(1.3E+02)	(6.5E-03)	16.0
21A	PHENANTHRENE	2.3E+04	4.8E+00	1.1E-02	7.6E+02	3.9E-02	9.0
21A	9-METHYLANTHRACENE	1.6E+04	(3.3E+00)	(7.5E-03)	(5.3E+02)	(2.7E-02)	10.0
21B	BENZ(A)ANTHRACENE	4.7E+03	3.5E+01	7.9E-02	1.6E+02	8.1E-03	7.0
21B	TRIPHENYLENE	4.6E+03	(5.9E+03)	(1.3E+01)	(1.5E+02)	(7.9E-03)	4.0
21B	CHRYSENE	8.0E+03	1.2E+00	2.7E-03	2.6E+02	1.4E-02	12.0
21B	PYRENE	9.0E+03	1.3E-02	3.0E-05	3.0E+02	1.5E-02	32.0
21C	DIBENZO(A,H)ANTHRACENE	2.8E+03	1.0E+04	2.2E+01	9.3E+01	4.8E-03	3.0
21C	BENZO(A)PYRENE	3.5E+03	5.8E+04	1.3E+02	1.2E+02	6.0E-03	1.0
21C	BENZO(E)PYRENE	2.1E+03	2.3E-01	5.1E-04	6.9E+01	3.6E-03	20.0
22A	FLUORENE	8.0E+03	(5.9E-02)	(1.3E-04)	(2.6E+02)	(1.4E-02)	24.0
22B	FLUORANTHENE	1.3E+04	4.6E-02	1.0E-04	4.3E+02	2.2E-02	25.0
21D	BENZO(G,H,I)PERYLENE	1.8E+03	(1.4E+01)	(3.1E-02)	(6.0E+01)	(3.1E-03)	8.0
22B	BENZO(A)FLUORENE	2.6E+03	(1.7E-02)	(3.8E-05)	(8.6E+01)	(4.5E-03)	29.0
22B	BENZO(B)FLUORENE	1.7E+03	(1.1E-02)	(2.5E-05)	(5.6E+01)	(2.9E-03)	33.0
22C	BENZO(K)FLUORANTHENE	1.6E+03	3.3E-02	7.5E-05	5.3E+01	2.7E-03	26.0
22C	BENZO(B)FLUORANTHENE	3.1E+03	1.2E+00	2.7E-03	1.0E+02	5.3E-03	13.0
22D	INDENO(1,2,3-CD)PYRENE	1.4E+03	2.9E-01	6.5E-04	4.6E+01	2.4E-03	19.0
23B	QUINOLINE	3.1E+03	6.5E-02	1.4E-04	1.0E+02	5.3E-03	23.0
23B	ACRIDINE	1.7E+03	6.1E-03	1.4E-05	5.6E+01	2.9E-03	36.0
23C	INDOLE	5.8E+01	1.8E-03	4.1E-06	1.9E+00	9.9E-05	39.0
23C	CARBAZOLE	1.2E+03	1.7E-02	3.8E-05	4.0E+01	2.1E-03	28.0
24B	DIBENZOFURAN	7.4E+03	7.1E-03	1.6E-05	2.4E+02	1.3E-02	34.0
25B	BENZOTHIOPHENE	5.3E+03	7.6E-02	1.7E-04	1.8E+02	9.1E-03	22.0

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Table 7.4

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
46A	LEAD	3.1E-01	6.2E-03	1.4E-05	1.0E-02	5.3E-07	35.0
49A	ARSENIC	1.9E+01	4.8E+01	1.1E-01	6.3E-01	3.3E-05	6.0
53A	SULFUR	1.8E+04	4.5E-01	1.0E-03	6.0E+02	3.1E-02	17.0
82A	CADMIUM	2.7E-02	2.7E-02	6.1E-05	8.9E-04	4.6E-00	27.0

SUM OF DS INCLUDING ALL COMPOUNDS = 8.8E+04 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 2.9E+03
SUM OF DS EXCLUDING SOME COMPOUNDS= 8.2E+04 SUM OF WDS/CR EXCLUDING SOME COMPOUNDS= 2.7E+03

SUM OF WDS INCLUDING ALL COMPOUNDS =2.0E+02 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 1.5E-01
SUM OF WDS EXCLUDING SOME COMPOUNDS=1.8E+02 SUM OF WDS/ER EXCLUDING SOME COMPOUNDS= 1.4E-01

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TABLE 7-5 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #21

Coal Type: Illinois #6

Stream Description: Ash (Discharge)

Stream Flow Rate: _____ m^3/s, _____ ft^3/s, 2.95E-3 g/s

Coal Feed Rate (CR): 6.78E-2 g/s (2.69E-1 tph)

Product Flow Rate: 1.76E-4 Nm^3/s (22.4 SCFH)

Product Heating Value: 7.41E6 J/Nm^3 (199 Btu/SCF)

Energy Production Rate (ER): 1310 J/s (4470 Btu/hr)

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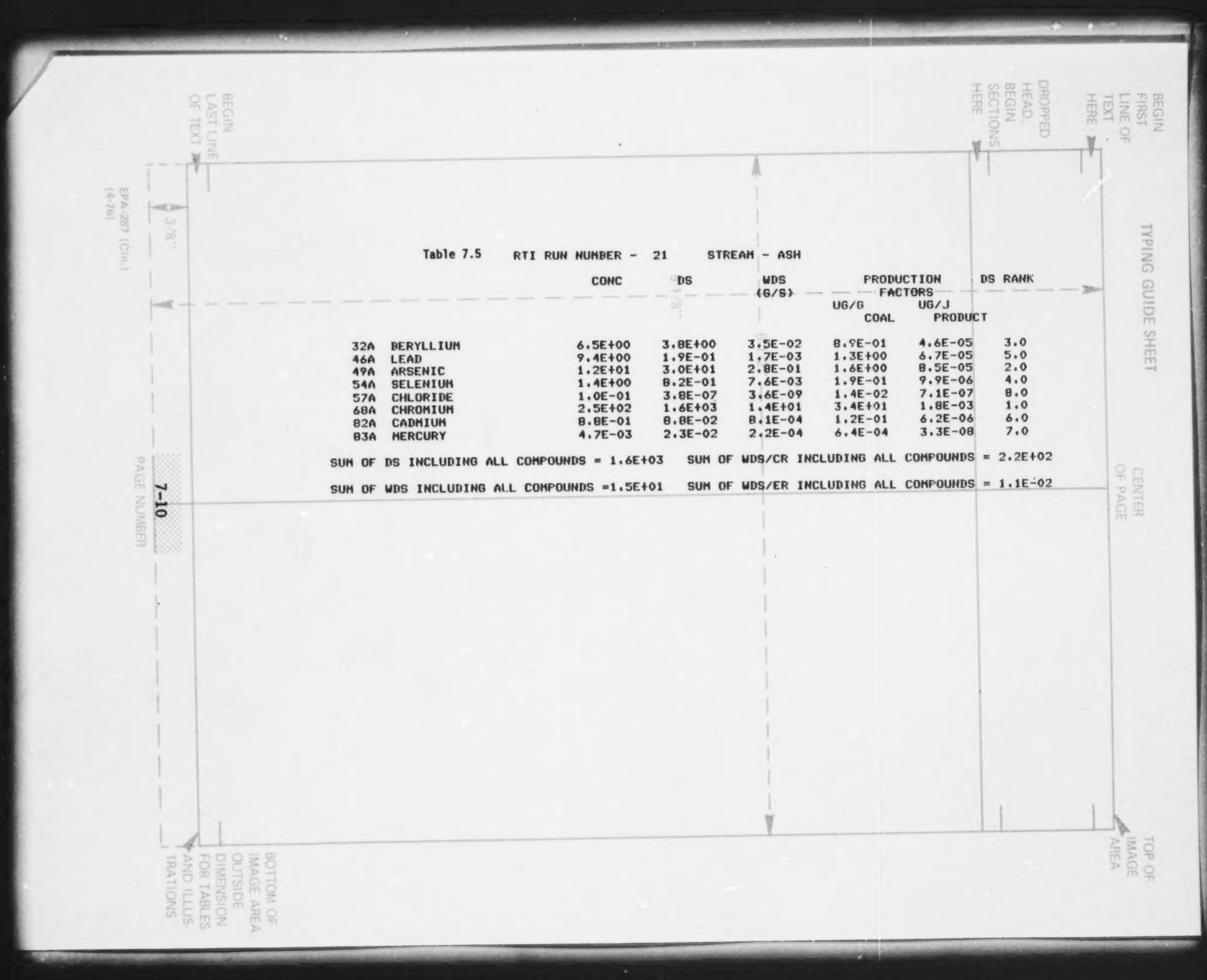

Table 7.5 RTI RUN NUMBER - 21 STREAM - ASH

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	PRODUCTION FACTORS UG/J PRODUCT	DS RANK
32A	BERYLLIUM	6.5E+00	3.8E+00	3.5E-02	8.9E-01	4.6E-05	3.0
46A	LEAD	9.4E+00	1.9E-01	1.7E-03	1.3E+00	6.7E-05	5.0
49A	ARSENIC	1.2E+01	3.0E+01	2.8E-01	1.6E+00	8.5E-05	2.0
54A	SELENIUM	1.4E+00	8.2E-01	7.6E-03	1.9E-01	9.9E-06	4.0
57A	CHLORIDE	1.0E-01	3.8E-07	3.6E-09	1.4E-02	7.1E-07	8.0
68A	CHROMIUM	2.5E+02	1.6E+03	1.4E+01	3.4E+01	1.8E-03	1.0
82A	CADMIUM	8.8E-01	8.8E-02	8.1E-04	1.2E-01	6.2E-06	6.0
83A	MERCURY	4.7E-03	2.3E-02	2.2E-04	6.4E-04	3.3E-08	7.0

SUM OF DS INCLUDING ALL COMPOUNDS = 1.6E+03 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 2.2E+02

SUM OF WDS INCLUDING ALL COMPOUNDS =1.5E+01 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 1.1E-02

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Table 7.6 RTI RUN NUMBER - 21 STREAM - GAS

STREAM FLOW RATE = 1.1E-01 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	42B	CARBON MONOXIDE	1000.
2.0	53B	HYDROGEN SULFIDE	1000.
3.0	99A	HYDROGEN	100.
4.0	42B	CARBON DIOXIDE	10.
5.0	25A	THIOPHENE	10.
6.0	13A	METHANETHIOL	10.
7.0	01A	METHANE	10.
8.0	53C	CARBONYL SULFIDE	10.
9.0	18A	XYLENOLS	10.
10.0	21A	NAPHTHALENE	1.
11.0	53D	CARBON DISULFIDE	1.
12.0	18A	CRESOLS	1.
13.0	25A	C2-THIOPHENES	1.
14.0	15A	BIPHENYL	1.
15.0	18A	PHENOL	1.

Table 7.7 RTI RUN NUMBER - 21 STREAM - CONDENSATE

STREAM FLOW RATE = 1.5E-01 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	18A	CRESOLS	10000.
2.0	18A	XYLENOLS	10000.
3.0	18A	TRIMETHYLPHENOL	1000.
4.0	47B	AMMONIA	1000.
5.0	68A	CHROMIUM	100.
6.0	49A	ARSENIC	100.
7.0	53A	THIOCYANATE	10.
8.0	47A	CYANIDE	1.
9.0	53A	SULFUR	1.
10.0	18A	PHENOL	1.
11.0	57A	CHLORIDES	1.

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Table 7.8 RTI RUN NUMBER - 21 STREAM - TAR

STREAM FLOW RATE = 2.2E-03 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	21C	BENZO(A)PYRENE	100000.
2.0	18A	CRESOLS	10000.
3.0	21C	DIBENZO(A,H)ANTHRACENE	10000.
4.0	21B	TRIPHENYLENE	10000.
5.0	18A	XYLENOLS	1000.
6.0	49A	ARSENIC	10.
7.0	21B	BENZ(A)ANTHRACENE	10.
8.0	21D	BENZO(G,H,I)PERYLENE	10.
9.0	21A	PHENANTHRENE	1.
10.0	21A	9-METHYLANTHRACENE	1.
11.0	21A	ACENAPHTHYLENE	1.
12.0	21B	CHRYSENE	1.
13.0	22C	BENZO(B)FLUORANTHENE	1.

6-1/2"

Table 7.9 RTI RUN NUMBER - 21 STREAM - ASH

STREAM FLOW RATE = 9.3E-03 GM/SEC

9-1/8"

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	68A	CHROMIUM	1000.
2.0	49A	ARSENIC	10.
3.0	32A	BERYLLIUM	1.

Table 7.10 RTI RUN NUMBER - 21 STREAM - GAS

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	42B	CARBON MONOXIDE	2.8E-01
2.0	53B	HYDROGEN SULFIDE	3.0E-02
3.0	99A	HYDROGEN	3.9E-03
4.0	42B	CARBON DIOXIDE	2.3E-03
5.0	25A	THIOPHENE	1.6E-03
6.0	13A	METHANETHIOL	1.0E-03
7.0	01A	METHANE	6.5E-04
8.0	53C	CARBONYL SULFIDE	6.3E-04
9.0	18A	XYLENOLS	3.2E-04
10.0	21A	NAPHTHALENE	2.0E-04
11.0	53D	CARBON DISULFIDE	2.0E-04
12.0	18A	CRESOLS	1.9E-04
13.0	25A	C2-THIOPHENES	1.8E-04
14.0	15A	BIPHENYL	1.1E-04
15.0	18A	PHENOL	8.8E-05

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Table 7.11 RTI RUN NUMBER - 21 STREAM - CONDENSATE

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	18A	CRESOLS	1.8E+00
2.0	18A	XYLENOLS	1.1E+00
3.0	18A	TRIMETHYLPHENOL	3.0E-01
4.0	47B	AMMONIA	1.3E-01
5.0	68A	CHROMIUM	3.0E-02
6.0	49A	ARSENIC	9.6E-03
7.0	53A	THIOCYANATE	2.6E-03
8.0	47A	CYANIDE	2.9E-04
9.0	53A	SULFUR	2.4E-04
10.0	18A	PHENOL	2.3E-04
11.0	57A	CHLORIDES	1.4E-04

Table 7.12 RTI RUN NUMBER - 21 STREAM - TAR

6-1/2"

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	21C	BENZO(A)PYRENE	7.3E-02
2.0	18A	CRESOLS	1.4E-02
3.0	21C	DIBENZO(A,H)ANTHRACENE	1.3E-02
4.0	21B	TRIPHENYLENE	7.4E-03
5.0	18A	XYLENOLS	3.4E-03
6.0	49A	ARSENIC	6.0E-05
7.0	21B	BENZ(A)ANTHRACENE	4.4E-05
8.0	21D	BENZO(G,H,I)PERYLENE	1.7E-05
9.0	21A	PHENANTHRENE	6.0E-06
10.0	21A	9-METHYLANTHRACENE	4.2E-06
11.0	21A	ACENAPHTHYLENE	3.1E-06
12.0	21B	CHRYSENE	1.5E-06
13.0	22C	BENZO(B)FLUORANTHENE	1.5E-06

Table 7.13 RTI RUN NUMBER - 21 STREAM - ASH

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	68A	CHROMIUM	8.1E-03
2.0	49A	ARSENIC	1.6E-04
3.0	32A	BERYLLIUM	2.0E-05

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TABLE 8-1 SUMMARY DISCHARGE SEVERITY MEASURES FOR SYNTHETIC FUEL PROCESSES

Process: RTI #23 Product Flow Rate: 3.17E-4 Nm^3/s (40.3 SCF/hr)

Coal Type: Illinois #6 Product Heating Value: 3.58E6 J/Nm^3 (96 Btu/SCF)

Coal Rate (CR): 8.91E-2 g/s (3.54E-4 T/hr) Energy Production Rate (ER): 1130 J/s (3860 Btu/hr)

Stream	Stream Flow Rate	$\sum$ DS	$\sum$ WDS	$\sum$ WDS/CR	$\sum$ WDS/ER	No. Compounds Identified	No. Compounds with DS≥1
Gas	1.6E-1 g/s	5.0E3	7.9E2 g/s	8.9E3 g/g	7.0E-1 g/J	19	11
Condensate	1.3E-1 g/s	4.5E4	5.8E3 g/s	6.5E4 g/g	5.1E0 g/J	8	5
Tar	2.9E-3 g/s	4.3E4	1.3E2 g/s	1.4E3 g/g	1.1E-1 g/J	20	6
Ash	1.4E-2 g/s	1.3E3	1.9E1 g/s	2.1E2 g/g	1.6E-2 g/J	7	4

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TABLE 8-2. ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #23

Coal Type: Illinois #6

Stream Description: Gas (Product)

Stream Flow Rate: 3.17E-4 Nm^3/s, ____ ℓ/s, 1.6E-1 g/s

Coal Feed Rate (CR): 8.91E-2 g/s (3.54E-4 tph)

Product Flow Rate: 3.17E-4 Nm^3/s (40.3 SCFH)

Product Heating Value: 3.58E6 J/Nm^3 (96 Btu/SCF)

Energy Production Rate (ER): 1130 J/s (3860 Btu/hr)

continued

Table 8.2 RTI RUN NUMBER - 23 STREAM - GAS

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	PRODUCTION FACTORS UG/J PRODUCT	DS RANK
01A	METHANE	3.4E+07	1.0E+01	1.6E+00	1.2E+05	9.5E+00	6.0
13A	METHANETHIOL	4.0E+03	4.0E+00	6.4E-01	1.4E+01	1.1E-03	8.5
13A	C2H6S	4.0E+03	4.0E+00	6.4E-01	1.4E+01	1.1E-03	8.5
15A	BENZENE	3.0E+06	1.0E+03	1.6E+02	1.1E+04	8.4E-01	2.0
15A	TOLUENE	1.0E+05	2.6E-01	4.2E-02	3.6E+02	2.8E-02	12.0
15A	ETHYLBENZENE	8.0E+02	1.8E-03	2.9E-04	2.8E+00	2.2E-04	17.0
15A	XYLENES	4.0E+03	9.1E-03	1.4E-03	1.4E+01	1.1E-03	15.0
15A	BIPHENYL	3.0E+01	3.0E-02	4.8E-03	1.1E-01	8.4E-06	14.0
15B	INDAN	2.0E+02	8.7E-04	1.4E-04	7.1E-01	5.6E-05	18.0
15B	INDENE	1.0E+02	2.2E-03	3.5E-04	3.6E-01	2.8E-05	16.0
21A	NAPHTHALENE	3.1E+03	6.2E-02	9.9E-03	1.1E+01	8.7E-04	13.0
21A	ANTHRACENE	7.0E+00	1.3E-04	2.0E-05	2.5E-02	2.0E-06	19.0
25A	C2-THIOPHENES	9.4E+04	(3.6E+00)	(5.8E-01)	(3.3E+02)	(2.6E-02)	10.0
42B	CARBON MONOXIDE	1.4E+08	3.5E+03	5.6E+02	5.0E+05	3.9E+01	1.0
42B	CARBON DIOXIDE	3.0E+08	3.3E+01	5.3E+00	1.1E+06	8.4E+01	5.0
53B	HYDROGEN SULFIDE	5.3E+06	3.5E+02	5.6E+01	1.9E+04	1.5E+00	3.0
53C	CARBONYL SULFIDE	2.2E+04	5.8E+00	9.2E-01	7.8E+01	6.2E-03	7.0
53D	CARBON DISULFIDE	4.0E+03	1.3E+00	2.1E-01	1.4E+01	1.1E-03	11.0
99A	HYDROGEN	2.0E+07	(4.9E+01)	(7.8E+00)	(7.1E+04)	(5.6E+00)	4.0

SUM OF DS INCLUDING ALL COMPOUNDS = 5.0E+03
SUM OF DS EXCLUDING SOME COMPOUNDS= 4.9E+03

SUM OF WDS INCLUDING ALL COMPOUNDS =7.9E+02
SUM OF WDS EXCLUDING SOME COMPOUNDS=7.8E+02

SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 8.9E+03
SUM OF WDS/CR EXCLUDING SOME COMPOUNDS= 8.8E+03

SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 7.0E-01
SUM OF WDS/ER EXCLUDING SOME COMPOUNDS= 6.9E-01

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TABLE 8-3 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #23

Coal Type: Illinois #6

Stream Description: Condensate (Discharge)

Stream Flow Rate: ____ m^3/s, 1.28E-4 l/s, 1.28E-1 g/s

Coal Feed Rate (CR): 8.91E-2 g/s (3.54E-4 tph)

Product Flow Rate: 3.17E-4 Nm^3/s (40.3 SCFH)

Product Heating Value: 3.58E6 J/Nm^3 (96 Btu/SCF)

Energy Production Rate (ER): 1130 J/s (3860 Btu/hr)

Table 8.3 RTI RUN NUMBER - 23 STREAM - CONDENSATE

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
18A	PHENOL	1.3E+05	7.6E+00	9.8E-01	1.9E+02	1.5E-02	5.0
18A	CRESOLS	1.6E+05	3.2E+04	4.1E+03	2.3E+02	1.8E-02	1.0
18A	XYLENOLS	6.3E+04	1.3E+04	1.6E+03	9.0E+01	7.1E-03	2.0
46A	LEAD	1.2E+01	4.8E-02	6.1E-03	1.7E-02	1.4E-06	6.0
49A	ARSENIC	1.0E+02	5.0E+01	6.4E+00	1.4E-01	1.1E-05	4.0
50A	ANTIMONY	9.6E+00	1.3E-02	1.7E-03	1.4E-02	1.1E-06	8.0
68A	CHROMIUM	3.6E+02	4.5E+02	5.8E+01	5.2E-01	4.1E-05	3.0
82A	CADMIUM	1.3E-01	2.6E-02	3.3E-03	1.9E-04	1.5E-08	7.0

SUM OF DS INCLUDING ALL COMPOUNDS = 4.5E+04 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 6.5E+04

SUM OF WDS INCLUDING ALL COMPOUNDS =5.8E+03 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 5.1E+00

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TABLE 8-4. ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #23

Coal Type: Illinois #6

Stream Description: Tar (Byproduct)

Stream Flow Rate: ____ m^3/s, 2.91E-6 m^3/s, 2.9E-3 g/s

Coal Feed Rate (CR): 8.91E-2 g/s (3.54E-4 tph)

Product Flow Rate: 3.17E-4 Nm^3/s (40.3 SCFH)

Product Heating Value: 3.58E6 J/Nm^3 (96 Btu/SCF)

Energy Production Rate (ER): 1130 J/s (3860 Btu/hr)

continued

Table 8.4 RTI RUN NUMBER - 23 STREAM - TAR

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
10C	BENZIDINE	6.0E+02	2.0E-01	5.8E-04	2.0E+01	1.5E-03	10.0
15A	BIPHENYL	2.2E+03	7.3E-01	2.1E-03	7.2E+01	5.6E-03	7.0
21A	C2-(ALKYL)NAPHTHALENE	7.4E+03	1.1E-02	3.2E-05	2.4E+02	1.9E-02	17.0
21A	1-METHYLNAPHTHALENE	2.5E+03	3.7E-03	1.1E-05	8.2E+01	6.4E-03	20.0
21A	ACENAPHTHYLENE	1.1E+04	(2.3E+00)	(6.7E-03)	(3.6E+02)	(2.8E-02)	6.0
21A	ACENAPHTHENE	2.7E+03	(5.6E-01)	(1.6E-03)	(8.8E+01)	(6.9E-03)	9.0
21B	BENZ(A)ANTHRACENE	2.8E+03	2.1E+01	6.1E-02	9.1E+01	7.2E-03	4.0
21B	TRIPHENYLENE	3.2E+03	(4.1E+03)	(1.2E+01)	(1.0E+02)	(8.2E-03)	3.0
21C	DIBENZO(A,H)ANTHRACENE	1.6E+03	5.7E+03	1.7E+01	5.2E+01	4.1E-03	2.0
21C	BENZO(A)PYRENE	2.0E+03	3.3E+04	9.7E+01	6.5E+01	5.1E-03	1.0
21C	BENZO(E)PYRENE	1.2E+03	1.3E-01	3.8E-04	3.9E+01	3.1E-03	12.0
21D	BENZO(G,H,I)PERYLENE	1.1E+03	(8.5E+00)	(2.5E-02)	(3.6E+01)	(2.8E-03)	5.0
22B	BENZO(A)FLUORENE	1.8E+03	(1.2E-02)	(3.4E-05)	(5.9E+01)	(4.6E-03)	16.0
22B	BENZO(B)FLUORENE	9.0E+02	(5.8E-03)	(1.7E-05)	(2.9E+01)	(2.3E-03)	19.0
22C	BENZO(K)FLUORANTHENE	9.0E+02	1.9E-02	5.4E-05	2.9E+01	2.3E-03	14.0
22C	BENZO(B)FLUORANTHENE	1.8E+03	6.9E-01	2.0E-03	5.9E+01	4.6E-03	8.0
22D	INDENO(1,2,3-CD)PYRENE	8.0E+02	1.7E-01	4.8E-04	2.6E+01	2.1E-03	11.0
23C	CARBAZOLE	1.2E+03	1.7E-02	5.0E-05	3.9E+01	3.1E-03	15.0
25B	BENZOTHIOPHENE	3.6E+03	5.1E-02	1.5E-04	1.2E+02	9.2E-03	13.0
46A	LEAD	4.9E-01	9.8E-03	2.8E-05	1.6E-02	1.3E-06	18.0

SUM OF DS INCLUDING ALL COMPOUNDS = 4.3E+04
SUM OF DS EXCLUDING SOME COMPOUNDS= 3.9E+04

SUM OF WDS INCLUDING ALL COMPOUNDS =1.3E+02
SUM OF WDS EXCLUDING SOME COMPOUNDS=1.1E+02

SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 1.4E+03
SUM OF WDS/CR EXCLUDING SOME COMPOUNDS= 1.3E+03

SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 1.1E-01
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TABLE 8-5 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #23

Coal Type: Illinois #6

Stream Description: Ash (Discharge)

Stream Flow Rate: ——— m^3/s, ——— ℓ/s, 1.45E-2 g/s

Coal Feed Rate (CR): 8.91E-2 g/s (3.54E-4 tph)

Product Flow Rate: 3.17E-4 Nm^3/s (40.3 SCFH)

Product Heating Value: 3.58E6 J/Nm^3 (96 Btu/SCF)

Energy Production Rate (ER): 1130 J/s (3860 Btu/hr)

Table 8.5 RTI RUN NUMBER - 23 STREAM - ASH

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
32A	BERYLLIUM	4.5E+00	2.6E+00	3.8E-02	7.3E-01	5.8E-05	3.0
46A	LEAD	4.9E+00	9.8E-02	1.4E-03	8.0E-01	6.3E-05	5.0
49A	ARSENIC	9.1E+00	2.3E+01	3.3E-01	1.5E+00	1.2E-04	2.0
54A	SELENIUM	1.7E+00	1.0E+00	1.4E-02	2.8E-01	2.2E-05	4.0
68A	CHROMIUM	2.0E+02	1.2E+03	1.8E+01	3.3E+01	2.6E-03	1.0
82A	CADMIUM	7.1E-01	7.1E-02	1.0E-03	1.2E-01	9.1E-06	6.0
83A	MERCURY	3.8E-03	1.9E-02	2.8E-04	6.2E-04	4.9E-08	7.0

SUM OF DS INCLUDING ALL COMPOUNDS = 1.3E+03 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 2.1E+02

SUM OF WDS INCLUDING ALL COMPOUNDS =1.9E+01 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 1.6E-02

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Table 8.6 RTI RUN NUMBER - 23 STREAM - GAS

STREAM FLOW RATE = 1.6E-01 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	42B	CARBON MONOXIDE	1000.
2.0	15A	BENZENE	1000.
3.0	53B	HYDROGEN SULFIDE	100.
4.0	99A	HYDROGEN	10.
5.0	42B	CARBON DIOXIDE	10.
6.0	01A	METHANE	10.
7.0	53C	CARBONYL SULFIDE	10.
8.5	13A	METHANETHIOL	1.
8.5	13A	C2H6S	1.
10.0	25A	C2-THIOPHENES	1.
11.0	53D	CARBON DISULFIDE	1.

6-1/2"

Table 8.7 RTI RUN NUMBER - 23 STREAM - CONDENSATE

STREAM FLOW RATE = 1.3E-01 GM/SEC

9-1/8"

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	18A	CRESOLS	10000.
2.0	18A	XYLENOLS	10000.
3.0	68A	CHROMIUM	100.
4.0	49A	ARSENIC	100.
5.0	18A	PHENOL	10.

Table 8.8 RTI RUN NUMBER - 23 STREAM - TAR

STREAM FLOW RATE = 2.9E-03 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	21C	BENZO(A)PYRENE	10000.
2.0	21C	DIBENZO(A,H)ANTHRACENE	10000.
3.0	21B	TRIPHENYLENE	1000.
4.0	21B	BENZ(A)ANTHRACENE	10.
5.0	21D	BENZO(G,H,I)PERYLENE	10.
6.0	21A	ACENAPHTHYLENE	1.

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Table 8.9 RTI RUN NUMBER - 23 STREAM - ASH

STREAM FLOW RATE = 1.4E-02 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	68A	CHROMIUM	1000.
2.0	49A	ARSENIC	10.
3.0	32A	BERYLLIUM	1.
4.0	54A	SELENIUM	1.

Table 8.10 RTI RUN NUMBER - 23 STREAM - GAS

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	42B	CARBON MONOXIDE	2.4E-01
2.0	15A	BENZENE	6.8E-02
3.0	53B	HYDROGEN SULFIDE	2.4E-02
4.0	99A	HYDROGEN	3.3E-03
5.0	42B	CARBON DIOXIDE	2.3E-03
6.0	01A	METHANE	7.0E-04
7.0	53C	CARBONYL SULFIDE	3.9E-04
8.5	13A	METHANETHIOL	2.7E-04
8.5	13A	C2H6S	2.7E-04
10.0	25A	C2-THIOPHENES	2.4E-04
11.0	53D	CARBON DISULFIDE	9.0E-05

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Table 8.11 RTI RUN NUMBER - 23 STREAM - CONDENSATE

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	18A	CRESOLS	1.7E+00
2.0	18A	XYLENOLS	6.9E-01
3.0	68A	CHROMIUM	2.4E-02
4.0	49A	ARSENIC	2.7E-03
5.0	18A	PHENOL	4.2E-04

Table 8.12 RTI RUN NUMBER - 23 STREAM - TAR

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	21C	BENZO(A)PYRENE	4.1E-02
2.0	21C	DIBENZO(A,H)ANTHRACENE	7.1E-03
3.0	21B	TRIPHENYLENE	5.1E-03
4.0	21B	BENZ(A)ANTHRACENE	2.6E-05
5.0	21D	BENZO(G,H,I)PERYLENE	1.0E-05
6.0	21A	ACENAPHTHYLENE	2.8E-06

9-1/8"

Table 8.13 RTI RUN NUMBER - 23 STREAM - ASH

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	68A	CHROMIUM	7.7E-03
2.0	49A	ARSENIC	1.4E-04
3.0	32A	BERYLLIUM	1.6E-05
4.0	54A	SELENIUM	6.2E-06

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TABLE 9-1. SUMMARY DISCHARGE SEVERITY MEASURES FOR SYNTHETIC FUEL PROCESSES

Process: RTI #25 Product Flow Rate: 3.31E-4 Nm^3/s (42.1 SCF/hr)

Coal Type: Montana Rosebud/McKay Product Heating Value: 5.29E6 J/Nm^3 (142 Btu/SCF)

Coal Rate (CR): 1.38E-1 g/s (5.48E-4 T/hr) Energy Production Rate (ER): 1750 J/s (5970 Btu/hr)

Stream	Stream Flow Rate	$\sum$ DS	$\sum$ WDS	$\sum$ WDS/CR	$\sum$ WDS/ER	No. Compounds Identified	No. Compounds with DS≥1
Gas	2.3E-1 g/s	6.6E3	1.5E3 g/s	1.1E4 g/g	8.7E-1 g/J	27	18
Condensate	7.2E-2 g/s	5.1E4	3.7E3 g/s	2.7E4 g/g	2.1E0 g/J	13	8
Tar	2.4E-3 g/s	1.6E5	3.8E2 g/s	2.8E3 g/g	2.2E-1 g/J	40	15
Ash	1.0E-2 g/s	7.5E2	7.8E0 g/s	5.6E1 g/g	4.5E-3 g/J	5	3

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TABLE 9-2 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #25

Coal Type: Montana Rosebud/McKay

Stream Description: Gas (Product)

Stream Flow Rate: 3.31E-4 Nm^3/s, _____ ℓ/s, 2.3E-1 g/s

Coal Feed Rate (CR): 1.38E-1 g/s (5.48E-4 tph)

Product Flow Rate: 3.31E-4 Nm^3/s (42.1 SCFH)

Product Heating Value: 5.29E6 J/Nm^3 (142 Btu/SCF)

Energy Production Rate (ER): 1750 J/s (5970 Btu/hr)

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Table 9-2 RTI RUN NUMBER - 25 STREAM - GAS

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	PRODUCTION FACTORS UG/J PRODUCT	DS RANK
01A	METHANE	2.8E+07	8.5E+00	2.0E+00	6.7E+04	5.3E+00	12.0
13A	METHANETHIOL	9.0E+03	9.0E+00	2.1E+00	2.2E+01	1.7E-03	11.0
13A	C2H6S	3.6E+02	3.6E-01	8.4E-02	8.6E-01	6.8E-05	20.0
15A	BENZENE	2.5E+06	8.3E+02	1.9E+02	6.0E+03	4.7E-01	3.0
15A	TOLUENE	9.0E+05	2.4E+00	5.5E-01	2.2E+03	1.7E-01	16.0
15A	ETHYLBENZENE	8.6E+04	2.0E-01	4.6E-02	2.1E+02	1.6E-02	22.0
15A	XYLENES	1.1E+05	2.5E-01	5.8E-02	2.6E+02	2.1E-02	21.0
15A	BIPHENYL	2.7E+03	2.7E+00	6.3E-01	6.5E+00	5.1E-04	14.5
15A	DIPHENYLMETHANE	2.7E+03	(2.7E+00)	(6.3E-01)	(6.5E+00)	(5.1E-04)	14.5
15B	INDAN	5.9E+02	2.6E-03	6.0E-04	1.4E+00	1.1E-04	26.0
15B	INDENE	6.3E+04	1.4E+00	3.3E-01	1.5E+02	1.2E-02	18.0
18A	PHENOL	3.9E+04	2.1E+00	4.8E-01	9.3E+01	7.4E-03	17.0
18A	CRESOLS	9.0E+04	4.1E+00	9.6E-01	2.2E+02	1.7E-02	13.0
21A	NAPHTHALENE	5.9E+05	1.2E+01	2.8E+00	1.4E+03	1.1E-01	10.0
21A	ANTHRACENE	1.2E+03	2.1E-02	5.0E-03	2.9E+00	2.3E-04	24.0
21A	PHENANTHRENE	7.8E+02	4.9E-01	1.1E-01	1.9E+00	1.5E-04	19.0
24A	BENZOFURAN	5.5E+04	1.0E-02	2.4E-03	1.3E+02	1.0E-02	25.0
24B	DIBENZOFURAN	1.2E+04	2.3E-03	5.3E-04	2.9E+01	2.3E-03	27.0
25A	THIOPHENE	6.6E+05	1.5E+02	3.4E+01	1.6E+03	1.2E-01	4.0
25A	C2-THIOPHENES	1.0E+03	(3.8E-02)	(9.0E-03)	(2.4E+00)	(1.9E-04)	23.0
42B	CARBON MONOXIDE	1.7E+08	4.3E+03	9.9E+02	4.1E+05	3.2E+01	1.0
42B	CARBON DIOXIDE	4.7E+08	5.2E+01	1.2E+01	1.1E+06	8.9E+01	5.0
47B	AMMONIA	2.3E+05	1.3E+01	3.0E+00	5.5E+02	4.3E-02	9.0
53B	HYDROGEN SULFIDE	1.7E+07	1.1E+03	2.7E+02	4.1E+04	3.2E+00	2.0
53C	CARBONYL SULFIDE	9.8E+04	2.6E+01	6.0E+00	2.3E+02	1.9E-02	7.0
53D	CARBON DISULFIDE	4.4E+04	1.5E+01	3.4E+00	1.1E+02	8.3E-03	8.0
99A	HYDROGEN	1.5E+07	(3.7E+01)	(8.6E+00)	(3.6E+04)	(2.8E+00)	6.0

SUM OF DS INCLUDING ALL COMPOUNDS = 6.6E+03
SUM OF DS EXCLUDING SOME COMPOUNDS= 6.5E+03

SUM OF WDS INCLUDING ALL COMPOUNDS =1.5E+03
SUM OF WDS EXCLUDING SOME COMPOUNDS=1.5E+03

SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 1.1E+04
SUM OF WDS/CR EXCLUDING SOME COMPOUNDS= 1.1E+04

SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 8.7E-01
SUM OF WDS/ER EXCLUDING SOME COMPOUNDS= 8.7E-01

TABLE 9-3 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #25

Coal Type: Montana Rosebud/McKay

Stream Description: Condensate (Discharge)

Stream Flow Rate: _____ m^3/s, 7.22E-5 ℓ/s, 7.22E-2 g/s

Coal Feed Rate (CR): 1.38E-1 g/s (5.48E-4 tph)

Product Flow Rate: 3.31E-4 Nm^3/s (42.1 SCFH)

Product Heating Value: 5.29E6 J/Nm^3 (142 Btu/SCF)

Energy Production Rate (ER): 1750 J/s (5970 Btu/hr)

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Table 9.3 RTI RUN NUMBER - 25 STREAM - CONDENSATE

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
18A	PHENOL	4.9E+05	2.9E+01	2.1E+00	2.6E+02	2.0E-02	5.0
18A	CRESOLS	2.2E+05	4.4E+04	3.2E+03	1.1E+02	9.1E-03	1.0
18A	XYLENOLS	1.8E+04	3.6E+03	2.6E+02	9.4E+00	7.4E-04	2.0
46A	LEAD	6.9E+01	2.8E-01	2.0E-02	3.6E-02	2.8E-06	11.0
47A	NITRATES	1.0E+01	7.1E-05	5.2E-06	5.2E-03	4.1E-07	13.0
47A	CYANIDE	1.3E+04	1.3E+01	9.4E-01	6.8E+00	5.4E-04	7.0
47B	AMMONIA	7.9E+06	3.2E+03	2.3E+02	4.1E+03	3.3E-01	3.0
48A	PHOSPHORUS	1.0E+02	6.7E-03	4.8E-04	5.2E-02	4.1E-06	12.0
53A	SULFUR	8.4E+05	4.2E+00	3.0E-01	4.4E+02	3.5E-02	8.0
53A	THIOCYANATE	2.1E+05	2.4E+01	1.7E+00	1.1E+02	8.6E-03	6.0
57A	CHLORIDES	1.1E+06	8.5E-01	6.1E-02	5.7E+02	4.5E-02	10.0
68A	CHROMIUM	4.6E+02	5.8E+02	4.2E+01	2.4E-01	1.9E-05	4.0
82A	CADMIUM	4.4E+00	8.8E-01	6.4E-02	2.3E-03	1.8E-07	9.0

SUM OF DS INCLUDING ALL COMPOUNDS = 5.1E+04 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 2.7E+04

SUM OF WDS INCLUDING ALL COMPOUNDS =3.7E+03 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 2.1E+00

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TABLE 9-4. ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #25

Coal Type: Montana Rosebud/McKay

Stream Description: Tar (Byproduct)

Stream Flow Rate: _____ m^3/s, 2.44E-6 ℓ/s, 2.4E-3 g/s

Coal Feed Rate (CR): 1.38E-1 g/s (5.48E-4 tph)

Product Flow Rate: 3.31E-4 Nm^3/s (42.1 SCFH)

Product Heating Value: 5.29E6 J/Nm^3 (142 Btu/SCF)

Energy Production Rate (ER): 1750 J/s (5970 Btu/hr)

continued

Table 9.4 RTI RUN NUMBER - 25 STREAM - TAR

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	PRODUCTION FACTORS UG/J PRODUCT	DS RANK
10C	ANILINE	1.9E+02	3.2E-03	7.7E-06	3.4E+00	2.6E-04	39.0
10C	BENZIDINE	2.0E+02	6.7E-02	1.6E-04	3.5E+00	2.8E-04	23.0
15A	BIPHENYL	2.9E+03	9.7E-01	2.4E-03	5.1E+01	4.0E-03	16.0
18A	PHENOL	4.6E+03	1.4E+00	3.3E-03	8.1E+01	6.4E-03	14.0
18A	CRESOLS	1.4E+04	1.4E+04	3.4E+01	2.5E+02	2.0E-02	3.0
18A	XYLENOLS	1.1E+04	1.1E+04	2.7E+01	1.9E+02	1.5E-02	5.0
18A	TRIMETHYLPHENOL	2.5E+03	2.5E+03	6.1E+00	4.4E+01	3.5E-03	7.5
18A	O-ISOPROPYLPHENOL	2.5E+03	(2.5E+03)	(6.1E+00)	(4.4E+01)	(3.5E-03)	7.5
21A	NAPHTHALENE	2.6E+04	1.7E-01	4.2E-04	4.6E+02	3.6E-02	21.0
21A	C2-(ALKYL)NAPHTHALENE	1.6E+04	2.4E-02	5.8E-05	2.8E+02	2.2E-02	31.0
21A	1-METHYLNAPHTHALENE	7.9E+03	1.2E-02	2.8E-05	1.4E+02	1.1E-02	34.0
21A	2-METHYLNAPHTHALENE	4.3E+03	6.3E-03	1.5E-05	7.6E+01	6.0E-03	35.0
21A	ACENAPHTHYLENE	1.8E+04	(3.7E+00)	(9.2E-03)	(3.2E+02)	(2.5E-02)	13.0
21A	ACENAPHTHENE	4.1E+03	(8.5E-01)	(2.1E-03)	(7.2E+01)	(5.7E-03)	18.0
21A	ANTHRACENE	7.4E+03	4.4E-02	1.1E-04	1.3E+02	1.0E-02	26.0
21A	PHENANTHRENE	2.3E+04	4.8E+00	1.2E-02	4.1E+02	3.2E-02	12.0
21B	BENZ(A)ANTHRACENE	7.0E+03	5.2E+01	1.3E-01	1.2E+02	9.8E-03	10.0
21B	TRIPHENYLENE	6.2E+03	(7.9E+03)	(1.9E+01)	(1.1E+02)	(8.6E-03)	6.0
21B	CHRYSENE	8.6E+03	1.3E+00	3.2E-03	1.5E+02	1.2E-02	15.0
21B	PYRENE	1.1E+04	1.6E-02	4.0E-05	1.9E+02	1.5E-02	32.0
21C	DIBENZO(A,H)ANTHRACENE	3.4E+03	1.2E+04	3.0E+01	6.0E+01	4.7E-03	4.0
21C	BENZO(A)PYRENE	2.7E+03	4.5E+04	1.1E+02	4.8E+01	3.8E-03	2.0
21C	BENZO(E)PYRENE	1.9E+03	2.1E-01	5.0E-04	3.4E+01	2.6E-03	20.0
21C	PERYLENE	3.7E+03	(6.2E+04)	(1.5E+02)	(6.5E+01)	(5.2E-03)	1.0
22A	FLUORENE	4.6E+02	(3.4E-03)	(8.3E-06)	(8.1E+00)	(6.4E-04)	38.0
22B	FLUORANTHENE	1.3E+04	4.6E-02	1.1E-04	2.3E+02	1.8E-02	25.0
21D	BENZO(G,H,I)PERYLENE	2.7E+03	(2.1E+01)	(5.1E-02)	(4.8E+01)	(3.8E-03)	11.0
22B	BENZO(A)FLUORENE	4.1E+03	(2.7E-02)	(6.5E-05)	(7.2E+01)	(5.7E-03)	28.0
22B	BENZO(B)FLUORENE	2.4E+03	(1.6E-02)	(3.8E-05)	(4.2E+01)	(3.3E-03)	33.0
22C	BENZO(K)FLUORANTHENE	1.2E+03	2.5E-02	6.1E-05	2.1E+01	1.7E-03	29.0
22C	BENZO(B)FLUORANTHENE	2.5E+03	9.6E-01	2.4E-03	4.4E+01	3.5E-03	17.0
22D	INDENO(1,2,3-CD)PYRENE	1.7E+03	3.5E-01	8.7E-04	3.0E+01	2.4E-03	19.0
23B	QUINOLINE	2.5E+03	5.2E-02	1.3E-04	4.4E+01	3.5E-03	24.0
23B	ACRIDINE	1.5E+03	5.4E-03	1.3E-05	2.6E+01	2.1E-03	36.0
23C	CARBAZOLE	2.6E+03	3.7E-02	9.1E-05	4.6E+01	3.6E-03	27.0
24B	DIBENZOFURAN	5.2E+03	5.0E-03	1.2E-05	9.2E+01	7.2E-03	37.0

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Table 9.4

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
25B	BENZOTHIOPHENE	1.7E+03	2.4E-02	5.9E-05	3.0E+01	2.4E-03	30.0
50A	ANTIMONY	7.0E-02	4.8E-04	1.2E-06	1.2E-03	9.8E-08	40.0
68A	CHROMIUM	1.1E+01	6.9E+01	1.7E-01	1.9E-01	1.5E-05	9.0
82A	CADMIUM	1.3E-01	1.3E-01	3.2E-04	2.3E-03	1.8E-07	22.0

SUM OF DS INCLUDING ALL COMPOUNDS = 1.6E+05 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 2.8E+03
SUM OF DS EXCLUDING SOME COMPOUNDS= 8.5E+04 SUM OF WDS/CR EXCLUDING SOME COMPOUNDS= 1.5E+03

SUM OF WDS INCLUDING ALL COMPOUNDS =3.8E+02 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 2.2E-01
SUM OF WDS EXCLUDING SOME COMPOUNDS=2.1E+02 SUM OF WDS/ER EXCLUDING SOME COMPOUNDS= 1.2E-01

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TABLE 9-5 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #25

Coal Type: Montana Rosebud/McKay

Stream Description: Ash (Discharge)

Stream Flow Rate: ——— m^3/s, ——— ℓ/s, 1.04E-2 g/s

Coal Feed Rate (CR): 1.38E-1 g/s (5.48E-4 tph)

Product Flow Rate: 3.31E-4 Nm^3/s (42.1 SCFH)

Product Heating Value: 5.29E6 J/Nm^3 (142 Btu/SCF)

Energy Production Rate (ER): 1750 J/s (5970 Btu/hr)

Table 9.6 RTI RUN NUMBER - 25 STREAM - ASH

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
32A	BERYLLIUM	4.9E+00	2.9E+00	3.0E-02	3.7E-01	2.9E-05	2.0
46A	LEAD	5.8E+00	1.2E-01	1.2E-03	4.3E-01	3.4E-05	3.0
68A	CHROMIUM	1.2E+02	7.5E+02	7.8E+00	9.0E+00	7.1E-04	1.0
82A	CADMIUM	2.7E-02	2.7E-03	2.8E-05	2.0E-03	1.6E-07	5.0
83A	MERCURY	8.9E-03	4.4E-02	4.6E-04	6.7E-04	5.3E-08	4.0

SUM OF DS INCLUDING ALL COMPOUNDS = 7.5E+02 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 5.6E+01

SUM OF WDS INCLUDING ALL COMPOUNDS =7.8E+00 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 4.5E-03

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Table 9.7 RTI RUN NUMBER - 25 STREAM - GAS

STREAM FLOW RATE = 2.3E-01 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	42B	CARBON MONOXIDE	1000.
2.0	53B	HYDROGEN SULFIDE	1000.
3.0	15A	BENZENE	1000.
4.0	25A	THIOPHENE	100.
5.0	42B	CARBON DIOXIDE	100.
6.0	99A	HYDROGEN	10.
7.0	53C	CARBONYL SULFIDE	10.
8.0	53D	CARBON DISULFIDE	10.
9.0	47B	AMMONIA	10.
10.0	21A	NAPHTHALENE	10.
11.0	13A	METHANETHIOL	10.
12.0	01A	METHANE	10.
13.0	18A	CRESOLS	1.
14.5	15A	BIPHENYL	1.
14.5	15A	DIPHENYLMETHANE	1.
16.0	15A	TOLUENE	1.
17.0	18A	PHENOL	1.
18.0	15B	INDENE	1.

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Table 9.8 RTI RUN NUMBER - 25 STREAM - CONDENSATE

STREAM FLOW RATE = 7.2E-02 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	18A	CRESOLS	10000.
2.0	18A	XYLENOLS	1000.
3.0	47B	AMMONIA	1000.
4.0	68A	CHROMIUM	1000.
5.0	18A	PHENOL	10.
6.0	53A	THIOCYANATE	10.
7.0	47A	CYANIDE	10.
8.0	53A	SULFUR	1.

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Table 9.9 RTI RUN NUMBER - 25 STREAM - TAR

STREAM FLOW RATE = 2.4E-03 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	21C	PERYLENE	100000.
2.0	21C	BENZO(A)PYRENE	10000.
3.0	18A	CRESOLS	10000.
4.0	21C	DIBENZO(A,H)ANTHRACENE	10000.
5.0	18A	XYLENOLS	10000.
6.0	21B	TRIPHENYLENE	10000.
7.5	18A	TRIMETHYLPHENOL	1000.
7.5	18A	O-ISOPROPYLPHENOL	1000.
9.0	68A	CHROMIUM	100.
10.0	21B	BENZ(A)ANTHRACENE	100.
11.0	21D	BENZO(G,H,I)PERYLENE	10.
12.0	21A	PHENANTHRENE	1.
13.0	21A	ACENAPHTHYLENE	1.
14.0	18A	PHENOL	1.
15.0	21B	CHRYSENE	1.

Table 9.10 RTI RUN NUMBER - 25 STREAM - ASH

STREAM FLOW RATE = 1.0E-02 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	68A	CHROMIUM	1000.
2.0	32A	BERYLLIUM	1.

Table 9.11 RTI RUN NUMBER - 25 STREAM - GAS

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	42B	CARBON MONOXIDE	3.4E-01
2.0	53B	HYDROGEN SULFIDE	9.1E-02
3.0	15A	BENZENE	6.7E-02
4.0	25A	THIOPHENE	1.2E-02
5.0	42B	CARBON DIOXIDE	4.2E-03
6.0	99A	HYDROGEN	3.0E-03
7.0	53C	CARBONYL SULFIDE	2.1E-03
8.0	53D	CARBON DISULFIDE	1.2E-03
9.0	47B	AMMONIA	1.0E-03
10.0	21A	NAPHTHALENE	9.5E-04
11.0	13A	METHANETHIOL	7.3E-04
12.0	01A	METHANE	6.8E-04
13.0	18A	CRESOLS	3.3E-04
14.5	15A	BIPHENYL	2.2E-04
14.5	15A	DIPHENYLMETHANE	2.2E-04
16.0	15A	TOLUENE	1.9E-04
17.0	18A	PHENOL	1.7E-04
18.0	15B	INDENE	1.1E-04

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Table 9.12 RTI RUN NUMBER - 25 STREAM - CONDENSATE

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	18A	CRESOLS	1.1E+00
2.0	18A	XYLENOLS	9.0E-02
3.0	47B	AMMONIA	7.9E-02
4.0	68A	CHROMIUM	1.4E-02
5.0	18A	PHENOL	7.2E-04
6.0	53A	THIOCYANATE	6.0E-04
7.0	47A	CYANIDE	3.2E-04
8.0	53A	SULFUR	1.0E-04

Table 9.13 RTI RUN NUMBER - 25 STREAM - TAR

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	21C	PERYLENE	5.2E-02
2.0	21C	BENZO(A)PYRENE	3.8E-02
3.0	18A	CRESOLS	1.2E-02
4.0	21C	DIBENZO(A,H)ANTHRACENE	1.0E-02
5.0	18A	XYLENOLS	9.3E-03
6.0	21B	TRIPHENYLENE	6.7E-03
7.5	18A	TRIMETHYLPHENOL	2.1E-03
7.5	18A	O-ISOPROPYLPHENOL	2.1E-03
9.0	68A	CHROMIUM	5.8E-05
10.0	21B	BENZ(A)ANTHRACENE	4.4E-05
11.0	21D	BENZO(G,H,I)PERYLENE	1.8E-05
12.0	21A	PHENANTHRENE	4.0E-06
13.0	21A	ACENAPHTHYLENE	3.2E-06
14.0	18A	PHENOL	1.1E-06
15.0	21B	CHRYSENE	1.1E-06

Table 9.14 RTI RUN NUMBER - 25 STREAM - ASH

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	68A	CHROMIUM	2.7E-03
2.0	32A	BERYLLIUM	1.0E-05

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TABLE 10.1 SUMMARY DISCHARGE SEVERITY MEASURES FOR SYNTHETIC FUEL PROCESSES

Process: RTI #35 Product Flow Rate: 5.16E-4 Nm^3/s (65.6 SCF/hr)

Coal Type: Wyoming Smith/Roland Product Heating Value: 4.77E6 J/Nm^3 (128 Btu/SCF)

Coal Rate (CR): 2.05E-1 g/s (8.17E-4 T/hr) Energy Production Rate (ER): 2460 J/s (8390 Btu/hr)

Stream	Stream Flow Rate	$\sum$DS	$\sum$WDS	$\sum$WDS/CR	$\sum$WDS/ER	No. Compounds Identified	No. Compounds with DS≥1
Gas	2.4E-1 g/s	6.1E3	1.5E3 g/s	7.1E3 g/g	6.0E-1 g/J	28	16
Condensate	7.7E-2 g/s	2.7E5	2.0E4 g/s	9.9E4 g/g	8.3E0 g/J	5	4
Tar	5.9E-3 g/s	5.1E4	3.0E2 g/s	1.5E3 g/g	1.2E-1 g/J	36	9
Ash	1.4E-2 g/s	1.2E3	1.7E1 g/s	8.1E1 g/g	6.7E-3 g/J	7	4

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TABLE 10.2 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #35

Coal Type: Wyoming Smith/Roland

Stream Description: Gas (Product)

Stream Flow Rate: 5.16E-4 Nm^3/s, ——— ℓ/s, 2.4E-1 g/s

Coal Feed Rate (CR): 2.06E-1 g/s (8.17E-4 tph)

Product Flow Rate: 5.1E-4 Nm^3/s (65.6 SCFH)

Product Heating Value: 4.77E6 J/Nm^3 (128 Btu/SCF)

Energy Production Rate (ER): 2460 J/s (8390 Btu/hr)

continued

Table 10.2 RTI RUN NUMBER - 35 STREAM - GAS

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
01A	METHANE	2.5E+07	7.6E+00	1.8E+00	6.3E+04	5.2E+00	11.0
13A	METHANETHIOL	1.0E+04	1.0E+01	2.4E+00	2.5E+01	2.1E-03	9.0
15A	BENZENE	1.5E+06	5.0E+02	1.2E+02	3.8E+03	3.1E-01	3.0
15A	TOLUENE	8.8E+05	2.3E+00	5.6E-01	2.2E+03	1.8E-01	14.0
15A	ETHYLBENZENE	8.0E+04	1.8E-01	4.4E-02	2.0E+02	1.7E-02	22.0
15A	XYLENES	3.2E+05	7.3E-01	1.8E-01	8.0E+02	6.7E-02	17.0
15A	BIPHENYL	1.2E+03	1.2E+00	2.9E-01	3.0E+00	2.5E-04	16.0
15A	DIPHENYLMETHANE	6.0E+02	(6.0E-01)	(1.5E-01)	(1.5E+00)	(1.3E-04)	19.0
15B	INDAN	7.8E+03	3.4E-02	8.2E-03	2.0E+01	1.6E-03	24.0
15B	INDENE	5.6E+04	1.2E+00	3.0E-01	1.4E+02	1.2E-02	15.0
15B	C3-BENZENES	4.8E+04	(2.2E-01)	(5.3E-02)	(1.2E+02)	(1.0E-02)	21.0
18A	PHENOL	2.4E+05	1.3E+01	3.1E+00	6.0E+02	5.0E-02	8.0
18A	CRESOLS	1.1E+05	5.0E+00	1.2E+00	2.8E+02	2.3E-02	12.0
18A	XYLENOLS	2.8E+05	2.2E+01	5.2E+00	7.0E+02	5.9E-02	6.0
21A	NAPHTHALENE	3.4E+04	6.8E-01	1.6E-01	8.5E+01	7.1E-03	18.0
21A	ACENAPHTHENE	2.0E+02	1.3E-02	3.0E-03	5.0E-01	4.2E-05	25.0
21A	ANTHRACENE	4.7E+02	8.4E-03	2.0E-03	1.2E+00	9.9E-05	26.0
21A	C15H12: 3 RINGS	8.0E+01	(5.0E-02)	(1.2E-02)	(2.0E-01)	(1.7E-05)	23.0
21B	C16H10: 4 RINGS	1.7E+02	(6.5E+02)	(1.6E+02)	(4.3E-01)	(3.6E-05)	2.0
24A	BENZOFURAN	4.2E+04	7.9E-03	1.9E-03	1.1E+02	8.8E-03	27.0
24B	DIBENZOFURAN	2.9E+03	5.5E-04	1.3E-04	7.3E+00	6.1E-04	28.0
25A	THIOPHENE	1.2E+04	2.7E+00	6.5E-01	3.0E+01	2.5E-03	13.0
25A	C2-THIOPHENES	9.3E+03	(3.6E-01)	(8.7E-02)	(2.3E+01)	(2.0E-03)	20.0
42B	CARBON MONOXIDE	1.9E+08	4.8E+03	1.2E+03	4.8E+05	4.0E+01	1.0
42B	CARBON DIOXIDE	2.4E+08	2.7E+01	6.5E+00	6.0E+05	5.0E+01	5.0
53B	HYDROGEN SULFIDE	1.3E+05	8.7E+00	2.1E+00	3.3E+02	2.7E-02	10.0
53C	CARBONYL SULFIDE	6.8E+04	1.8E+01	4.3E+00	1.7E+02	1.4E-02	7.0
99A	HYDROGEN	1.1E+07	(2.7E+01)	(6.5E+00)	(2.8E+04)	(2.3E+00)	4.0

SUM OF DS INCLUDING ALL COMPOUNDS = 6.1E+03
SUM OF DS EXCLUDING SOME COMPOUNDS= 5.4E+03

SUM OF WDS INCLUDING ALL COMPOUNDS =1.5E+03
SUM OF WDS EXCLUDING SOME COMPOUNDS=1.3E+03

SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 7.1E+03
SUM OF WDS/CR EXCLUDING SOME COMPOUNDS= 6.3E+03

SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 6.0E-01
SUM OF WDS/ER EXCLUDING SOME COMPOUNDS= 5.3E-01

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TABLE 10-3 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #35

Coal Type: Wyoming Smith/Roland

Stream Description: Condensate (Discharge)

Stream Flow Rate: ____ m^3/s, 7.77E-5 L/s, 7.77E-2 g/s

Coal Feed Rate (CR): 2.06E-1 g/s (8.17E-4 tph)

Product Flow Rate: 5.16E-4 Nm^3/s (65.6 SCFH)

Product Heating Value: 4.77E6 J/Nm^3 (128 Btu/SCF)

Energy Production Rate (ER): 2460 J/s (8390 Btu/hr)

Table 10.3 RTI RUN NUMBER - 35 STREAM - CONDENSATE

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
18A	PHENOL	1.8E+06	1.1E+02	8.1E+00	6.7E+02	5.6E-02	3.0
18A	CRESOLS	1.1E+06	2.2E+05	1.7E+04	4.1E+02	3.4E-02	1.0
18A	XYLENOLS	2.3E+05	4.6E+04	3.5E+03	8.6E+01	7.2E-03	2.0
46A	LEAD	2.1E+01	8.4E-02	6.5E-03	7.8E-03	6.6E-07	5.0
82A	CADMIUM	1.5E+01	3.0E+00	2.3E-01	5.6E-03	4.7E-07	4.0

SUM OF DS INCLUDING ALL COMPOUNDS = 2.7E+05 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 9.9E+04

SUM OF WDS INCLUDING ALL COMPOUNDS =2.0E+04 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 8.3E+00

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TABLE 10.4 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #35

Coal Type: Wyoming Smith/Roland

Stream Description: Tar (Byproduct)

Stream Flow Rate: _____ m^3/s, 5.94E-6 ℓ/s, 5.9E-3 g/s

Coal Feed Rate (CR): 2.06E-1 g/s (8.17E-4 tph)

Product Flow Rate: 5.16E-4 Nm^3/s (65.6 SCFH)

Product Heating Value: 4.77E6 J/Nm^3 (128 Btu/SCF)

Energy Production Rate (ER): 2460 J/s (8390 Btu/hr)

continued

Table 10.4 RTI RUN NUMBER - 35 STREAM - TAR

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
10C	ANILINE	4.8E+01	8.0E-04	4.8E-06	1.4E+00	1.2E-04	33.0
10C	BENZIDINE	2.0E-03	6.7E-07	4.0E-09	5.8E-05	4.8E-09	36.0
15A	BIPHENYL	1.5E+03	5.0E-01	3.0E-03	4.3E+01	3.6E-03	10.0
18A	PHENOL	1.1E+04	3.2E+00	1.9E-02	3.2E+02	2.7E-02	8.0
18A	CRESOLS	2.7E+04	2.7E+04	1.6E+02	7.8E+02	6.5E-02	1.0
18A	XYLENOLS	1.7E+04	1.7E+04	1.0E+02	4.9E+02	4.1E-02	2.0
18A	TRIMETHYLPHENOL	1.4E+03	1.4E+03	8.3E+00	4.0E+01	3.4E-03	4.0
18A	O-ISOPROPYLPHENOL	6.2E+02	(6.2E+02)	(3.7E+00)	(1.8E+01)	(1.5E-03)	6.0
21A	NAPHTHALENE	1.6E+03	1.1E-02	6.3E-05	4.6E+01	3.9E-03	20.0
21A	C2-(ALKYL)NAPHTHALENE	8.2E+03	1.2E-02	7.2E-05	2.4E+02	2.0E-02	19.0
21A	1-METHYLNAPHTHALENE	4.9E+03	7.2E-03	4.3E-05	1.4E+02	1.2E-02	21.0
21A	2-METHYLNAPHTHALENE	3.8E+03	5.6E-03	3.3E-05	1.1E+02	9.2E-03	26.0
21A	ACENAPHTHYLENE	1.7E+03	(3.5E-01)	(2.1E-03)	(4.9E+01)	(4.1E-03)	12.0
21A	ACENAPHTHENE	1.5E+03	(3.1E-01)	(1.9E-03)	(4.3E+01)	(3.6E-03)	14.0
21A	ANTHRACENE	2.6E+03	1.5E-02	9.2E-05	7.5E+01	6.3E-03	17.0
21A	PHENANTHRENE	1.6E+03	3.3E-01	2.0E-03	4.6E+01	3.9E-03	13.0
21A	9-METHYLANTHRACENE	1.9E+03	(4.0E-01)	(2.4E-03)	(5.5E+01)	(4.6E-03)	11.0
21B	BENZ(A)ANTHRACENE	2.0E+02	1.5E+00	8.9E-03	5.8E+00	4.8E-04	9.0
21B	TRIPHENYLENE	3.0E+02	(3.8E+02)	(2.3E+00)	(8.7E+00)	(7.2E-04)	7.0
21B	CHRYSENE	6.9E+02	1.0E-01	6.2E-04	2.0E+01	1.7E-03	15.0
21B	PYRENE	1.2E+03	1.8E-03	1.0E-05	3.5E+01	2.9E-03	29.0
21C	BENZO(A)PYRENE	5.0E+01	8.3E+02	5.0E+00	1.4E+00	1.2E-04	5.0
21C	BENZO(E)PYRENE	3.0E+01	3.3E-03	1.9E-05	8.7E-01	7.2E-05	27.0
21C	PERYLENE	2.4E+02	(4.0E+03)	(2.4E+01)	(6.9E+00)	(5.8E-04)	3.0
22A	FLUORENE	1.7E+03	(1.3E-02)	(7.4E-05)	(4.9E+01)	(4.1E-03)	18.0
22B	FLUORANTHENE	4.1E+02	1.5E-03	8.7E-06	1.2E+01	9.9E-04	30.0
22B	BENZO(A)FLUORENE	1.1E+03	(7.1E-03)	(4.2E-05)	(3.2E+01)	(2.7E-03)	23.0
22B	BENZO(B)FLUORENE	9.0E+02	(5.8E-03)	(3.5E-05)	(2.6E+01)	(2.2E-03)	24.0
22C	BENZO(K)FLUORANTHENE	4.0E+01	8.3E-04	5.0E-06	1.2E+00	9.7E-05	32.0
22C	BENZO(B)FLUORANTHENE	6.0E+01	2.3E-02	1.4E-04	1.7E+00	1.4E-04	16.0
23B	QUINOLINE	1.2E+02	2.5E-03	1.5E-05	3.5E+00	2.9E-04	28.0
23B	ACRIDINE	3.4E+01	1.2E-04	7.2E-07	9.8E-01	8.2E-05	35.0
23C	INDOLE	2.4E+01	7.5E-04	4.5E-06	6.9E-01	5.8E-05	34.0
23C	CARBAZOLE	5.0E+02	7.1E-03	4.2E-05	1.4E+01	1.2E-03	22.0

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Table 10.4
CONC
DS
WDS (G/S)
PRODUCTION FACTORS UG/G COAL
UG/J PRODUCT
DS RANK
24B DIBENZOFURAN 1.4E+03 1.3E-03 8.0E-06 4.0E+01 3.4E-03 31.0
25B BENZOTHIOPHENE 4.0E+02 5.7E-03 3.4E-05 1.2E+01 9.7E-04 25.0
SUM OF DS INCLUDING ALL COMPOUNDS = 5.1E+04
SUM OF DS EXCLUDING SOME COMPOUNDS= 4.6E+04
SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 1.5E+03
SUM OF WDS/CR EXCLUDING SOME COMPOUNDS= 1.3E+03
SUM OF WDS INCLUDING ALL COMPOUNDS =3.0E+02
SUM OF WDS EXCLUDING SOME COMPOUNDS=2.7E+02
SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 1.2E-01
SUM OF WDS/ER EXCLUDING SOME COMPOUNDS= 1.1E-01
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TABLE 10 5 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #35

Coal Type: Wyoming Smith/Roland

Stream Description: Ash (Discharge)

Stream Flow Rate: ——— m^3/s, ——— ℓ/s, 1.39E-2 g/s

Coal Feed Rate (CR): 2.06E-1 g/s (8.17E-4 tph)

Product Flow Rate: 5.16E-4 Nm^3/s (6.56E1 SCFH)

Product Heating Value: 4.77E6 J/Nm^3 (128 Btu/SCF)

Energy Production Rate (ER): 2460 J/s (8390 Btu/hr)

Table 10.5 RTI RUN NUMBER - 35 STREAM - ASH

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
32A	BERYLLIUM	3.4E+00	2.0E+00	2.8E-02	2.3E-01	1.9E-05	3.0
46A	LEAD	2.3E+00	4.6E-02	6.4E-04	1.6E-01	1.3E-05	5.0
54A	SELENIUM	5.8E+00	3.4E+00	4.7E-02	3.9E-01	3.3E-05	2.0
57A	CHLORIDE	3.0E-01	1.2E-06	1.6E-08	2.0E-02	1.7E-06	7.0
68A	CHROMIUM	1.9E+02	1.2E+03	1.7E+01	1.3E+01	1.1E-03	1.0
82A	CADMIUM	2.2E-01	2.2E-02	3.1E-04	1.5E-02	1.2E-06	6.0
83A	MERCURY	1.0E-02	5.0E-02	7.0E-04	6.8E-04	5.7E-08	4.0

SUM OF DS INCLUDING ALL COMPOUNDS = 1.2E+03 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 8.1E+01

SUM OF WDS INCLUDING ALL COMPOUNDS =1.7E+01 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 6.7E-03

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Table 10.6 RTI RUN NUMBER - 35 STREAM - GAS

STREAM FLOW RATE = 2.4E-01 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	42B	CARBON MONOXIDE	1000.
2.0	21B	C16H10: 4 RINGS	1000.
3.0	15A	BENZENE	1000.
4.0	99A	HYDROGEN	10.
5.0	42B	CARBON DIOXIDE	10.
6.0	18A	XYLENOLS	10.
7.0	53C	CARBONYL SULFIDE	10.
8.0	18A	PHENOL	10.
9.0	13A	METHANETHIOL	10.
10.0	53B	HYDROGEN SULFIDE	10.
11.0	01A	METHANE	10.
12.0	18A	CRESOLS	10.
13.0	25A	THIOPHENE	1.
14.0	15A	TOLUENE	1.
15.0	15B	INDENE	1.
16.0	15A	BIPHENYL	1.

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Table 10.7 RTI RUN NUMBER - 35 STREAM - CONDENSATE

STREAM FLOW RATE = 7.7E-02 GM/SEC

9-1/8"

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	18A	CRESOLS	100000.
2.0	18A	XYLENOLS	10000.
3.0	18A	PHENOL	100.
4.0	82A	CADMIUM	1.

Table 10.8 RTI RUN NUMBER - 35 STREAM - TAR

STREAM FLOW RATE = 5.9E-03 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	18A	CRESOLS	10000.
2.0	18A	XYLENOLS	10000.
3.0	21C	PERYLENE	1000.
4.0	18A	TRIMETHYLPHENOL	1000.
5.0	21C	BENZO(A)PYRENE	1000.
6.0	18A	O-ISOPROPYLPHENOL	1000.
7.0	21B	TRIPHENYLENE	100.
8.0	18A	PHENOL	1.
9.0	21B	BENZ(A)ANTHRACENE	1.

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Table 10.9 RTI RUN NUMBER - 35 STREAM - ASH

STREAM FLOW RATE = 1.4E-02 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	68A	CHROMIUM	1000.
2.0	54A	SELENIUM	1.
3.0	32A	BERYLLIUM	1.

Table 10.10 RTI RUN NUMBER - 35 STREAM - GAS

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	42B	CARBON MONOXIDE	2.9E-01
2.0	21B	C16H10; 4 RINGS	4.0E-02
3.0	15A	BENZENE	3.1E-02
4.0	99A	HYDROGEN	1.7E-03
5.0	42B	CARBON DIOXIDE	1.6E-03
6.0	18A	XYLENOLS	1.3E-03
7.0	53C	CARBONYL SULFIDE	1.1E-03
8.0	18A	PHENOL	7.8E-04
9.0	13A	METHANETHIOL	6.2E-04
10.0	53B	HYDROGEN SULFIDE	5.3E-04
11.0	01A	METHANE	4.7E-04
12.0	18A	CRESOLS	3.1E-04
13.0	25A	THIOPHENE	1.6E-04
14.0	15A	TOLUENE	1.4E-04
15.0	15B	INDENE	7.7E-05
16.0	15A	BIPHENYL	7.4E-05

Table 10.11 RTI RUN NUMBER - 35 STREAM - CONDENSATE

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	18A	CRESOLS	4.3E+00
2.0	18A	XYLENOLS	9.0E-01
3.0	18A	PHENOL	2.1E-03
4.0	82A	CADMIUM	5.9E-05

Table 10.12 RTI RUN NUMBER - 35 STREAM - TAR

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	18A	CRESOLS	4.1E-02
2.0	18A	XYLENOLS	2.6E-02
3.0	21C	PERYLENE	6.0E-03
4.0	18A	TRIMETHYLPHENOL	2.1E-03
5.0	21C	BENZO(A)PYRENE	1.3E-03
6.0	18A	O-ISOPROPYLPHENOL	9.4E-04
7.0	21B	TRIPHENYLENE	5.8E-04
8.0	18A	PHENOL	4.9E-06
9.0	21B	BENZ(A)ANTHRACENE	2.3E-06

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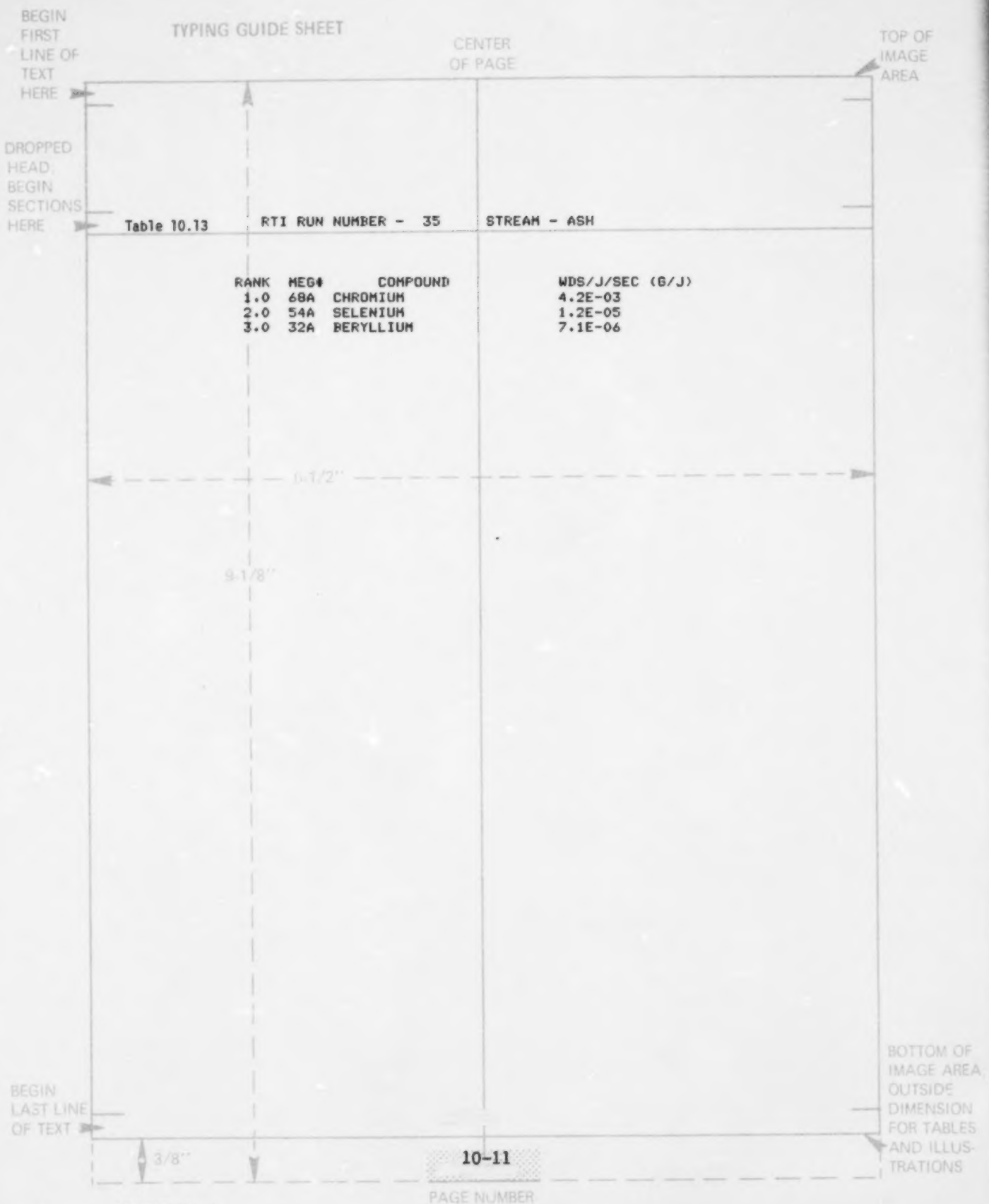

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TABLE 11-1 SUMMARY DISCHARGE SEVERITY MEASURES FOR SYNTHETIC FUEL PROCESSES

Process: RTI #36 Product Flow Rate: 4.09E-4 Nm^3/s (52 SCF/hr)

Coal Type: ND Beulah/Zap Lignite Product Heating Value: 5.21E6 J/Nm^3 (140 Btu/SCF)

Coal Rate (CR): 1.78E-1 g/s (7.06E-4 T/hr) Energy Production Rate (ER): 2130 J/s (7270 Btu/hr)

Stream	Stream Flow Rate	$\sum_{DS}$	$\sum_{WDS}$	$\sum_{WDS/CR}$	$\sum_{WDS/ER}$	No. Compounds Identified	No. Compounds with DS≧1
Gas	2.0E-1 g/s	7.5E3	1.5E3 g/s	8.6E3 g/g	7.2E-1 g/J	26	16
Condensate	9.3E-2 g/s	1.3E5	1.2E4 g/s	7.0E4 g/g	5.8E0 g/J	9	7
Tar	1.2E-3 g/s	5.2E4	6.4E1 g/s	3.6E2 g/g	3.0E-2 g/J	42	16
Ash	8.9E-3 g/s	1.6E4	1.4E2 g/s	7.8E2 g/g	6.6E-2 g/J	6	3

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TABLE 11.2 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #36

Coal Type: ND Beulah/Zap Lignite

Stream Description: Gas (Product)

Stream Flow Rate: 4.09E-4 Nm^3/s, ——— ℓ/s, 2.0E-1 g/s

Coal Feed Rate (CR): 1.78E-1 g/s (7.06E-4 tph)

Product Flow Rate: 4.09E-4 Nm^3/s (52.0 SCFH)

Product Heating Value: 5.21E6 J/Nm^3 (140 Btu/SCF)

Energy Production Rate (ER): 2130 J/s (7270 Btu/hr)

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Table 11.2

RTI RUN NUMBER - 36 STREAM - GAS

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/J COAL	PRODUCT	DS RANK
		2.1E+07	6.4E+00	1.3E+00	4.8E+04	4.0E+00	11.0
01A	METHANE	3.4E+04	3.4E+01	6.9E+00	7.8E+01	6.5E-03	5.0
13A	METHANETHIOL	9.7E+03	9.7E+00	2.0E+00	2.2E+01	1.9E-03	10.0
13A	C2H6S	7.7E+02	7.7E+02	1.6E+02	5.3E+03	4.4E-01	2.0
15A	BENZENE	2.3E+06	1.6E+00	3.3E-01	1.4E+03	1.2E-01	15.0
15A	TOLUENE	6.2E+05	1.7E-01	3.5E-02	1.7E+02	1.5E-02	21.0
15A	ETHYLBENZENE	7.6E+04	1.7E-01	7.9E-02	3.9E+02	3.3E-02	19.0
15A	XYLENES	1.7E+05	3.9E-01	2.8E-01	3.2E+00	2.7E-04	16.0
15A	BIPHENYL	1.4E+03	1.4E+00	(9.6E-02)	(1.1E+00)	(9.0E-05)	18.0
15A	DIPHENYLMETHANE	4.7E+02	(4.7E-01)	(9.6E-02)	6.4E+00	5.4E-04	24.0
15B	INDAN	2.8E+03	1.2E-02	2.5E-03	7.8E+01	6.5E-03	17.0
15B	INDENE	3.4E+04	7.6E-01	1.5E-01	1.6E+02	1.3E-02	12.0
15B	PHENOL	6.9E+04	3.6E+00	7.4E-01	1.4E+02	1.1E-02	13.0
18A	CRESOLS	5.9E+04	2.7E+00	5.5E-01	4.8E+02	4.0E-02	9.0
18A	XYLENOLS	2.1E+05	1.6E+01	3.3E+00	2.3E+02	1.9E-02	14.0
18A	NAPHTHALENE	1.0E+05	2.0E+00	4.1E-01	6.9E-01	5.8E-05	23.0
21A	ACENAPHTHENE	3.0E+02	1.9E-02	3.8E-03	9.2E-01	7.7E-05	25.0
21A	ANTHRACENE	4.0E+02	7.1E-03	1.5E-03	1.4E+01	1.2E-03	26.0
21A	BENZOFURAN	6.2E+03	1.2E-03	2.4E-04	1.4E+01	4.2E-02	4.0
24A	THIOPHENE	2.2E+05	4.9E+01	9.9E+00	5.0E+02	4.2E-02	4.0
25A	METHYLTHIOPHENE	5.8E+03	2.5E-01	5.1E-02	1.3E+01	1.1E-03	20.0
25A	C2-THIOPHENES	5.6E+02	(2.2E-02)	(4.4E-03)	(1.3E+00)	(1.1E-04)	22.0
42B	CARBON MONOXIDE	2.6E+08	6.5E+03	1.3E+03	6.0E+05	5.0E+01	1.0
42B	CARBON DIOXIDE	2.0E+08	2.2E+01	4.5E+00	4.6E+05	3.8E+01	7.0
42B	HYDROGEN SULFIDE	1.0E+06	6.7E+01	1.4E+01	2.3E+03	1.9E-01	3.0
53B	CARBONYL SULFIDE	7.5E+04	2.0E+01	4.0E+00	1.7E+02	1.4E-02	8.0
53C	HYDROGEN	1.2E+07	(2.9E+01)	(6.0E+00)	(2.8E+04)	(2.3E+00)	6.0
99A							

SUM OF DS INCLUDING ALL COMPOUNDS = 7.5E+03 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 8.6E+03
SUM OF DS EXCLUDING SOME COMPOUNDS= 7.5E+03 SUM OF WDS/CR EXCLUDING SOME COMPOUNDS= 8.6E+03

SUM OF WDS INCLUDING ALL COMPOUNDS =1.5E+03 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 7.2E-01
SUM OF WDS EXCLUDING SOME COMPOUNDS=1.5E+03 SUM OF WDS/ER EXCLUDING SOME COMPOUNDS= 7.2E-01

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TABLE 11.3 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #36

Coal Type: ND Beulah/Zap Lignite

Stream Description: Condensate (Discharge)

Stream Flow Rate: _____ m^3/s, 9.26E-5 L/s, 9.26E-2 g/s

Coal Feed Rate (CR): 1.78E-1 g/s (7.06E-4 tph)

Product Flow Rate: 4.09E-4 Nm^3/s (52.0 SCFH)

Product Heating Value: 5.21E6 J/Nm^3 (140 Btu/SCF)

Energy Production Rate (ER): 2130 J/s (7270 Btu/hr)

Table 11-3 RTI RUN NUMBER - 36 STREAM - CONDENSATE

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
18A	PHENOL	1.0E+06	5.9E+01	5.4E+00	5.2E+02	4.3E-02	5.0
18A	CRESOLS	5.3E+05	1.1E+05	9.8E+03	2.8E+02	2.3E-02	1.0
18A	XYLENOLS	1.3E+05	2.6E+04	2.4E+03	6.8E+01	5.6E-03	2.0
46A	LEAD	4.4E+01	1.8E-01	1.6E-02	2.3E-02	1.9E-06	8.0
47B	HYDROGEN CYANIDE	8.6E+03	8.6E+00	8.0E-01	4.5E+00	3.7E-04	7.0
47B	AMMONIA	5.3E+06	2.1E+03	2.0E+02	2.8E+03	2.3E-01	3.0
49A	ARSENIC	2.9E+01	1.5E+01	1.3E+00	1.5E-02	1.3E-06	6.0
68A	CHROMIUM	1.8E+02	2.3E+02	2.1E+01	9.3E-02	7.8E-06	4.0
82A	CADMIUM	1.3E-01	2.6E-02	2.4E-03	6.8E-05	5.6E-09	9.0

SUM OF DS INCLUDING ALL COMPOUNDS = 1.3E+05 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 7.0E+04

SUM OF WDS INCLUDING ALL COMPOUNDS =1.2E+04 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 5.8E+00

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Table 11-3 RTI RUN NUMBER - 36 STREAM - CONDENSATE

		CONC	DS	WDS (B/S)	PRODUCTION FACTORS UG/B COAL	UG/J PRODUCT	DS RANK
18A	PHENOL	1.0E+06	5.9E+01	5.4E+00	5.2E+02	4.3E-02	5.0
18A	CRESOLS	5.3E+05	1.1E+05	9.8E+03	2.8E+02	2.3E-02	1.0
18A	XYLENOLS	1.3E+05	2.6E+04	2.4E+03	4.8E+01	5.6E-03	2.0
46A	LEAD	4.4E+01	1.8E-01	1.6E-02	2.3E-02	1.9E-06	8.0
47B	HYDROGEN CYANIDE	8.6E+03	8.6E+00	8.0E-01	4.5E+00	3.7E-04	7.0
47B	AMMONIA	5.3E+06	2.1E+03	2.0E+02	2.8E+03	2.3E-01	3.0
49A	ARSENIC	2.9E+01	1.5E+01	1.3E+00	1.5E-02	1.3E-06	6.0
68A	CHROMIUM	1.8E+02	2.3E+02	2.1E+01	9.3E-02	7.8E-06	4.0
82A	CADMIUM	1.3E-01	2.6E-02	2.4E-03	6.8E-05	5.6E-09	9.0

SUM OF DS INCLUDING ALL COMPOUNDS = 1.3E+05 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 7.0E+04

SUM OF WDS INCLUDING ALL COMPOUNDS =1.2E+04 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 5.8E+00

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TABLE 11.4 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #36

Coal Type: ND Beulah/Zap Lignite

Stream Description: Tar (Byproduct)

Stream Flow Rate: _____ m^3/s, 1.23E-6 l/s, - 1.2E-3 g/s

Coal Feed Rate (CR): 1.78E-1 g/s (7.06E-4 tph)

Product Flow Rate: 4.09E-4 Nm^3/s (52.0 SCFH)

Product Heating Value: 5.21E6 J/Nm^3 (140 Btu/SCF)

Energy Production Rate (ER): 2130 J/s (7270 Btu/hr)

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Table 11.4 RTI RUN NUMBER - 36 STREAM - TAR

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	PRODUCTION FACTORS UG/J PRODUCT	DS RANK
10C	BENZIDINE	3.0E+02	1.0E-01	1.2E-04	2.1E+00	1.7E-04	20.0
15A	BIPHENYL	3.8E+03	1.3E+00	1.6E-03	2.6E+01	2.2E-03	16.0
18A	PHENOL	5.6E+03	1.6E+00	2.0E-03	3.9E+01	3.2E-03	13.0
18A	CRESOLS	1.1E+04	1.1E+04	1.4E+01	7.6E+01	6.4E-03	3.0
18A	XYLENOLS	8.4E+02	8.4E+02	1.0E+00	5.8E+00	4.9E-04	8.0
18A	TRIMETHYLPHENOL	1.7E+03	1.7E+03	2.1E+00	1.2E+01	9.8E-04	5.0
18A	O-ISOPROPYLPHENOL	5.0E+02	(5.0E+02)	(6.2E-01)	(3.5E+00)	(2.9E-04)	9.0
21A	NAPHTHALENE	2.2E+03	1.5E-02	1.8E-05	1.5E+01	1.3E-03	33.0
21A	C2-(ALKYL)NAPHTHALENE	6.9E+03	1.0E-02	1.3E-05	4.8E+01	4.0E-03	36.0
21A	1-METHYLNAPHTHALENE	7.1E+03	1.0E-02	1.3E-05	4.9E+01	4.1E-03	35.0
21A	2-METHYLNAPHTHALENE	4.3E+03	6.3E-03	7.8E-06	3.0E+01	2.5E-03	39.0
21A	ACENAPHTHYLENE	1.5E+04	(3.1E+00)	(3.9E-03)	(1.0E+02)	(8.7E-03)	11.0
21A	ACENAPHTHENE	3.9E+03	(8.1E-01)	(1.0E-03)	(2.7E+01)	(2.3E-03)	17.0
21A	ANTHRACENE	1.2E+04	7.1E-02	8.8E-05	8.3E+01	7.0E-03	21.0
21A	PHENANTHRENE	7.4E+03	1.5E+00	1.9E-03	5.1E+01	4.3E-03	14.0
21A	9-METHYLANTHRACENE	1.7E+02	(3.5E-02)	(4.4E-05)	(1.2E+00)	(9.8E-05)	26.0
21B	BENZ(A)ANTHRACENE	2.1E+03	1.6E+01	1.9E-02	1.5E+01	1.2E-03	10.0
21B	TRIPHENYLENE	2.5E+03	(3.2E+03)	(4.0E+00)	(1.7E+01)	(1.4E-03)	4.0
21B	CHRYSENE	2.6E+03	3.9E-01	4.9E-04	1.8E+01	1.5E-03	19.0
21B	PYRENE	4.8E+03	7.1E-03	8.7E-06	3.3E+01	2.8E-03	38.0
21C	DIBENZO(A,H)ANTHRACENE	3.0E+02	1.1E+03	1.3E+00	2.1E+00	1.7E-04	7.0
21C	BENZO(A)PYRENE	1.1E+03	1.8E+04	2.3E+01	7.6E+00	6.4E-04	1.0
21C	BENZO(E)PYRENE	6.0E+02	6.5E-02	8.1E-05	4.2E+00	3.5E-04	22.0
21C	PERYLENE	8.3E+02	(1.4E+04)	(1.7E+01)	(5.7E+00)	(4.8E-04)	2.0
22A	FLUORENE	4.8E+03	(3.5E-02)	(4.4E-05)	(3.3E+01)	(2.8E-03)	27.0
22B	FLUORANTHENE	7.6E+03	2.7E-02	3.4E-05	5.3E+01	4.4E-03	29.0
21D	BENZO(G,H,I)PERYLENE	2.0E+02	(1.5E+00)	(1.9E-03)	(1.4E+00)	(1.2E-04)	15.0
22B	BENZO(A)FLUORENE	2.6E+03	(1.7E-02)	(2.1E-05)	(1.8E+01)	(1.5E-03)	32.0
22B	BENZO(B)FLUORENE	1.7E+03	(1.1E-02)	(1.4E-05)	(1.2E+01)	(9.8E-04)	34.0
22C	BENZO(K)FLUORANTHENE	1.1E+03	2.3E-02	2.8E-05	7.6E+00	6.4E-04	30.0
22C	BENZO(B)FLUORANTHENE	1.4E+03	5.4E-01	6.6E-04	9.7E+00	8.1E-04	18.0
22D	INDENO(1,2,3-CD)PYRENE	1.0E+02	2.1E-02	2.6E-05	6.9E-01	5.8E-05	31.0
23B	QUINOLINE	1.4E+03	2.9E-02	3.6E-05	9.7E+00	8.1E-04	28.0
23B	ACRIDINE	1.0E+03	3.6E-03	4.4E-06	6.9E+00	5.8E-04	40.0
23C	CARBAZOLE	5.0E+02	7.1E-03	8.8E-06	3.5E+00	2.9E-04	37.0

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Table 11.4

		CONC	DS	WDS (B/S)	PRODUCTION FACTORS UG/J COAL	PRODUCTION FACTORS UG/J PRODUCT	DS RANK
24B	DIBENZOFURAN	3.7E+03	3.6E-03	4.4E-06	2.6E+01	2.1E-03	41.0
25B	BENZOTHIOPHENE	3.3E+03	4.7E-02	5.8E-05	2.3E+01	1.9E-03	25.0
46A	LEAD	2.5E+00	5.0E-02	6.2E-05	1.7E-02	1.4E-06	23.5
49A	ARSENIC	8.0E-01	2.0E+00	2.5E-03	5.5E-03	4.6E-07	12.0
50A	ANTIMONY	5.0E-01	3.4E-03	4.2E-06	3.5E-03	2.9E-07	42.0
68A	CHROMIUM	2.0E+02	1.2E+03	1.5E+00	1.4E+00	1.2E-04	6.0
82A	CADMIUM	5.0E-02	5.0E-02	6.2E-05	3.5E-04	2.9E-08	23.5

SUM OF DS INCLUDING ALL COMPOUNDS = 5.2E+04 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 3.6E+02
SUM OF DS EXCLUDING SOME COMPOUNDS= 3.4E+04 SUM OF WDS/CR EXCLUDING SOME COMPOUNDS= 2.4E+02

SUM OF WDS INCLUDING ALL COMPOUNDS =6.4E+01 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 3.0E-02
SUM OF WDS EXCLUDING SOME COMPOUNDS=4.2E+01 SUM OF WDS/ER EXCLUDING SOME COMPOUNDS= 2.0E-02

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TABLE 11.5 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #36

Coal Type: ND Beulah/Zap Lignite

Stream Description: Ash (Discharge)

Stream Flow Rate: _____ m^3/s, _____ ℓ/s, 8.89E-3 g/s

Coal Feed Rate (CR): 1.78E-1 g/s (7.06E-4 tph)

Product Flow Rate: 4.09E-4 Nm^3/s (52.0 SCFH)

Product Heating Value: 5.21E6 J/Nm^3 (140 Btu/SCF)

Energy Production Rate (ER): 2130 J/s (7270 Btu/hr)

Table 11.5 RTI RUN NUMBER - 36 STREAM - ASH

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
32A	BERYLLIUM	3.6E+00	2.1E+00	1.9E-02	1.8E-01	1.5E-05	3.0
46A	LEAD	1.4E+00	2.8E-02	2.5E-04	7.0E-02	5.8E-06	5.0
49A	ARSENIC	4.1E+01	1.0E+02	9.1E-01	2.0E+00	1.7E-04	2.0
57A	CHLORIDE	7.9E-01	3.0E-06	2.7E-08	3.9E-02	3.3E-06	6.0
68A	CHROMIUM	2.5E+03	1.6E+04	1.4E+02	1.2E+02	1.0E-02	1.0
82A	CADMIUM	5.0E-01	5.0E-02	4.4E-04	2.5E-02	2.1E-06	4.0

SUM OF DS INCLUDING ALL COMPOUNDS = 1.6E+04 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 7.8E+02

SUM OF WDS INCLUDING ALL COMPOUNDS =1.4E+02 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 6.6E-02

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Table 11.6 RTI RUN NUMBER - 36 STREAM - GAS

STREAM FLOW RATE = 2.0E-01 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	42B	CARBON MONOXIDE	10000.
2.0	15A	BENZENE	1000.
3.0	53B	HYDROGEN SULFIDE	100.
4.0	25A	THIOPHENE	10.
5.0	13A	METHANETHIOL	10.
6.0	99A	HYDROGEN	10.
7.0	42B	CARBON DIOXIDE	10.
8.0	53C	CARBONYL SULFIDE	10.
9.0	18A	XYLENOLS	10.
10.0	13A	C2H6S	10.
11.0	01A	METHANE	10.
12.0	18A	PHENOL	1.
13.0	18A	CRESOLS	1.
14.0	21A	NAPHTHALENE	1.
15.0	15A	TOLUENE	1.
16.0	15A	BIPHENYL	1.

6-1/2"

Table 11.7 RTI RUN NUMBER - 36 STREAM - CONDENSATE

STREAM FLOW RATE = 9.3E-02 GM/SEC

9-1/8"

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	18A	CRESOLS	100000.
2.0	18A	XYLENOLS	10000.
3.0	47B	AMMONIA	1000.
4.0	68A	CHROMIUM	100.
5.0	18A	PHENOL	100.
6.0	49A	ARSENIC	10.
7.0	47B	HYDROGEN CYANIDE	10.

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EPA-287 (Cin.)
(4-76)

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Table 11.8 RTI RUN NUMBER - 36 STREAM - TAR

STREAM FLOW RATE = 1.2E-03 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	21C	BENZO(A)PYRENE	10000.
2.0	21C	PERYLENE	10000.
3.0	18A	CRESOLS	10000.
4.0	21B	TRIPHENYLENE	1000.
5.0	18A	TRIMETHYLPHENOL	1000.
6.0	68A	CHROMIUM	1000.
7.0	21C	DIBENZO(A,H)ANTHRACENE	1000.
8.0	18A	XYLENOLS	1000.
9.0	18A	O-ISOPROPYLPHENOL	1000.
10.0	21B	BENZ(A)ANTHRACENE	10.
11.0	21A	ACENAPHTHYLENE	1.
12.0	49A	ARSENIC	1.
13.0	18A	PHENOL	1.
14.0	21A	PHENANTHRENE	1.
15.0	21D	BENZO(G,H,I)PERYLENE	1.
16.0	15A	BIPHENYL	1.

Table 11.9 RTI RUN NUMBER - 36 STREAM - ASH

STREAM FLOW RATE = 8.9E-03 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	68A	CHROMIUM	10000.
2.0	49A	ARSENIC	100.
3.0	32A	BERYLLIUM	1.

Table 11.10 RTI RUN NUMBER - 36 STREAM - GAS

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	42B	CARBON MONOXIDE	4.0E-01
2.0	15A	BENZENE	4.8E-02
3.0	53B	HYDROGEN SULFIDE	4.2E-03
4.0	25A	THIOPHENE	3.0E-03
5.0	13A	METHANETHIOL	2.1E-03
6.0	99A	HYDROGEN	1.8E-03
7.0	42B	CARBON DIOXIDE	1.4E-03
8.0	53C	CARBONYL SULFIDE	1.2E-03
9.0	18A	XYLENOLS	1.0E-03
10.0	13A	C2H6S	6.0E-04
11.0	01A	METHANE	4.0E-04
12.0	18A	PHENOL	2.3E-04
13.0	18A	CRESOLS	1.7E-04
14.0	21A	NAPHTHALENE	1.2E-04
15.0	15A	TOLUENE	1.0E-04
16.0	15A	BIPHENYL	8.7E-05

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Table 11.11 RTI RUN NUMBER - 36 STREAM - CONDENSATE

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	18A	CRESOLS	3.0E+00
2.0	18A	XYLENOLS	7.4E-01
3.0	47B	AMMONIA	6.0E-02
4.0	68A	CHROMIUM	6.4E-03
5.0	18A	PHENOL	1.7E-03
6.0	49A	ARSENIC	4.1E-04
7.0	47B	HYDROGEN CYANIDE	2.4E-04

Table 11.12 RTI RUN NUMBER - 36 STREAM - TAR

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	21C	BENZO(A)PYRENE	6.9E-03
2.0	21C	PERYLENE	5.2E-03
3.0	18A	CRESOLS	4.2E-03
4.0	21B	TRIPHENYLENE	1.2E-03
5.0	18A	TRIMETHYLPHENOL	6.4E-04
6.0	68A	CHROMIUM	4.7E-04
7.0	21C	DIBENZO(A,H)ANTHRACENE	4.0E-04
8.0	18A	XYLENOLS	3.2E-04
9.0	18A	O-ISOPROPYLPHENOL	1.9E-04
10.0	21B	BENZ(A)ANTHRACENE	5.9E-06
11.0	21A	ACENAPHTHYLENE	1.2E-06
12.0	49A	ARSENIC	7.6E-07
13.0	18A	PHENOL	6.2E-07
14.0	21A	PHENANTHRENE	5.8E-07
15.0	21B	BENZO(G,H,I)PERYLENE	5.8E-07
16.0	15A	BIPHENYL	4.8E-07

Table 11.13 RTI RUN NUMBER - 36 STREAM - ASH

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	68A	CHROMIUM	4.3E-02
2.0	49A	ARSENIC	2.8E-04
3.0	32A	BERYLLIUM	5.8E-06

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TABLE 12.1 SUMMARY DISCHARGE SEVERITY MEASURES FOR SYNTHETIC FUEL PROCESSES

Process: RTI #41 Product Flow Rate: 2.0E-4 Nm^3/s (25.4 SCF/hr)

Coal Type: W. Kentucky #9 Product Heating Value: 5.81E6 J/Nm^3 (156 Btu/SCF)

Coal Rate (CR): 5.95E-2 g/s (2.36E-4 T/hr) Energy Production Rate (ER): 1160 J/s (3960 Btu/hr)

Stream	Stream Flow Rate	$\sum$DS	$\sum$WDS	$\sum$WDS/CR	$\sum$WDS/ER	No. Compounds Identified	No. Compounds with DS≥1
Gas	1.1E-1 g/s	6.5E3	6.9E2 g/s	1.2E4 g/g	6.0E-1 g/J	31	18
Condensate	6.5E-2 g/s	8.0E4	5.2E3 g/s	8.7E4 g/g	4.5E0 g/J	3	3
Tar	1.8E-3 g/s	5.1E4	9.1E1 g/s	1.5E3 g/g	7.8E-2 g/J	37	11
Ash	4.8E-3 g/s	2.4E1	1.2E-1 g/s	1.9E0 g/g	1.0E-4 g/J	4	2

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TABLE 12.2 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #41

Coal Type: W. Kentucky #9

Stream Description: Gas (Product)

Stream Flow Rate: 2.00E-4 Nm^3/s, ——— ℓ/s, 1.1E-1 g/s

Coal Feed Rate (CR): 5.95E-2 g/s (2.36E-4 tph)

Product Flow Rate: 2.00E-4 Nm^3/s (25.4 SCFH)

Product Heating Value: 5.81E6 J/Nm^3 (156 Btu/SCF)

Energy Production Rate (ER): 1160 J/s (3960 Btu/hr)

continued

Table 12.2 Continued RTI RUN NUMBER - 41 STREAM - GAS

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	PRODUCTION FACTORS UG/J PRODUCT	DS RANK
01A	METHANE	3.5E+07	1.1E+01	1.1E+00	1.2E+05	6.0E+00	10.0
13A	METHANETHIOL	1.0E+04	1.0E+01	1.1E+00	3.4E+01	1.7E-03	11.0
13A	C2H6S	3.0E+04	3.0E+01	3.2E+00	1.0E+02	5.2E-03	7.0
15A	BENZENE	3.3E+06	1.1E+03	1.2E+02	1.1E+04	5.7E-01	2.0
15A	TOLUENE	4.4E+05	1.2E+00	1.2E-01	1.5E+03	7.6E-02	17.0
15A	ETHYLBENZENE	2.1E+04	4.8E-02	5.1E-03	7.0E+01	3.6E-03	26.0
15A	XYLENES	7.3E+04	1.7E-01	1.8E-02	2.4E+02	1.3E-02	20.0
15A	BIPHENYL	1.5E+03	1.5E+00	1.6E-01	5.0E+00	2.6E-04	16.0
15A	C4-BENZENE	2.5E+05	(1.0E+00)	(1.1E-01)	(8.4E+02)	(4.3E-02)	18.0
15B	INDAN	1.3E+04	5.7E-02	6.0E-03	4.4E+01	2.2E-03	25.0
15B	INDENE	1.3E+05	2.9E+00	3.1E-01	4.4E+02	2.2E-02	14.0
15B	XYLENES	1.2E+04	2.7E-02	2.9E-03	4.0E+01	2.1E-03	28.0
15B	METHYLINDENE	2.6E+03	(5.8E-02)	(6.1E-03)	(8.7E+00)	(4.5E-04)	24.0
15B	C3-BENZENES	3.6E+04	(1.6E-01)	(1.7E-02)	(1.2E+02)	(6.2E-03)	21.0
18A	PHENOL	9.6E+04	5.1E+00	5.4E-01	3.2E+02	1.7E-02	12.0
18A	CRESOLS	6.2E+04	2.8E+00	3.0E-01	2.1E+02	1.1E-02	15.0
21A	NAPHTHALENE	5.6E+05	1.1E+01	1.2E+00	1.9E+03	9.6E-02	9.0
21A	ALPHA-METHYLNAPHTHALENE	2.4E+03	1.0E-02	1.1E-03	8.0E+00	4.1E-04	29.0
21A	ACENAPHTHENE	1.3E+03	8.1E-02	8.6E-03	4.4E+00	2.2E-04	22.0
21A	ANTHRACENE	1.8E+03	3.2E-02	3.4E-03	6.0E+00	3.1E-04	27.0
24A	BENZOFURAN	3.1E+04	5.8E-03	6.2E-04	1.0E+02	5.3E-03	30.0
24B	DIBENZOFURAN	9.3E+02	1.8E-04	1.9E-05	3.1E+00	1.6E-04	31.0
25A	THIOPHENE	7.0E+04	1.6E+01	1.6E+00	2.3E+02	1.2E-02	8.0
25A	METHYLTHIOPHENE	8.7E+04	3.8E+00	4.0E-01	2.9E+02	1.5E-02	13.0
25A	DIMETHYLTHIOPHENE	1.5E+04	5.8E-01	6.1E-02	5.0E+01	2.6E-03	19.0
42B	CARBON MONOXIDE	1.9E+08	4.8E+03	5.0E+02	6.4E+05	3.3E+01	1.0
42B	CARBON DIOXIDE	2.8E+08	3.1E+01	3.3E+00	9.4E+05	4.8E+01	6.0
53B	HYDROGEN SULFIDE	7.1E+06	4.7E+02	5.0E+01	2.4E+04	1.2E+00	3.0
53C	CARBONYL SULFIDE	1.5E+05	3.9E+01	4.2E+00	5.0E+02	2.6E-02	4.0
53D	CARBON DISULFIDE	2.0E+02	6.7E-02	7.1E-03	6.7E-01	3.4E-05	23.0
99A	HYDROGEN	1.4E+07	(3.4E+01)	(3.6E+00)	(4.7E+04)	(2.4E+00)	5.0

SUM OF DS INCLUDING ALL COMPOUNDS = 6.5E+03
SUM OF DS EXCLUDING SOME COMPOUNDS= 6.5E+03

SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 1.2E+04
SUM OF WDS/CR EXCLUDING SOME COMPOUNDS= 1.2E+04

SUM OF WDS INCLUDING ALL COMPOUNDS =6.9E+02
SUM OF WDS EXCLUDING SOME COMPOUNDS=6.9E+02

SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 6.0E-01
SUM OF WDS/ER EXCLUDING SOME COMPOUNDS= 5.9E-01

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TABLE 12.3 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #41

Coal Type: W. Kentucky #9

Stream Description: Condensate (Discharge)

Stream Flow Rate: ____ m^3/s, 1.90E-4 ℓ/s, 1.90E-1 g/s

Coal Feed Rate (CR): 5.95E-2 g/s (2.36E-4 tph)

Product Flow Rate: 2.00E-4 Nm^3/s (25.4 SCFH)

Product Heating Value: 5.81E6 J/Nm^3 (156 Btu/SCF)

Energy Production Rate (ER): 1160 J/s (3960 Btu/hr)

Table 12.3 Continued RTI RUN NUMBER - 41 STREAM - CONDENSATE

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	PRODUCTION FACTORS UG/J PRODUCT	DS RANK
18A	PHENOL	3.9E+05	2.3E+01	1.5E+00	4.2E+02	2.2E-02	3.0
18A	CRESOLS	3.5E+05	7.0E+04	4.5E+03	3.8E+02	2.0E-02	1.0
18A	XYLENOLS	4.9E+04	9.8E+03	6.3E+02	5.3E+01	2.7E-03	2.0

SUM OF DS INCLUDING ALL COMPOUNDS = 8.0E+04 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 8.7E+04

SUM OF WDS INCLUDING ALL COMPOUNDS =5.2E+03 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 4.5E+00

TABLE 12.4 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #41

Coal Type: W. Kentucky #9

Stream Description: Tar (Byproduct)

Stream Flow Rate: _____ m^3/s, 5.26E-5 ℓ/s, 5.3E-2 g/s

Coal Feed Rate (CR): 5.92E-2 g/s (2.36E-4 tph)

Product Flow Rate: 2.00E-4 Nm^3/s (25.4 SCFH)

Product Heating Value: 5.81E6 J/Nm^3 (156 Btu/SCF)

Energy Production Rate (ER): 1160 J/s (3960 Btu/hr)

continued

Table 12.4 Continued RTI RUN NUMBER - 41 STREAM - TAR

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	PRODUCTION FACTORS UG/J PRODUCT	DS RANK
10C	ANILINE	2.1E+01	3.5E-04	6.3E-07	6.3E-01	3.2E-05	36.0
10C	BENZIDINE	4.0E+02	1.3E-01	2.4E-04	1.2E+01	6.2E-04	19.0
15A	BIPHENYL	2.9E+03	9.7E-01	1.7E-03	8.7E+01	4.5E-03	12.0
18A	PHENOL	1.2E+03	3.5E-01	6.3E-04	3.6E+01	1.9E-03	16.0
18A	CRESOLS	8.6E+03	8.6E+03	1.5E+01	2.6E+02	1.3E-02	2.0
18A	XYLENOLS	4.8E+03	4.8E+03	8.6E+00	1.4E+02	7.4E-03	4.0
18A	TRIMETHYLPHENOL	1.7E+03	1.7E+03	3.0E+00	5.1E+01	2.6E-03	5.0
18A	O-ISOPROPYLPHENOL	7.2E+02	(7.2E+02)	(1.3E+00)	(2.2E+01)	(1.1E-03)	7.0
21A	NAPHTHALENE	8.5E+03	5.7E-02	1.0E-04	2.6E+02	1.3E-02	23.0
21A	C2-(ALKYL)NAPHTHALENE	2.0E+03	2.9E-03	5.3E-06	6.0E+01	3.1E-03	34.0
21A	1-METHYLNAPHTHALENE	3.4E+03	5.0E-03	8.9E-06	1.0E+02	5.2E-03	32.0
21A	2-METHYLNAPHTHALENE	6.4E+03	9.4E-03	1.7E-05	1.9E+02	9.9E-03	29.0
21A	ACENAPHTHYLENE	6.0E+03	(1.3E+00)	(2.2E-03)	(1.8E+02)	(9.3E-03)	11.0
21A	ACENAPHTHENE	4.2E+03	(8.7E-01)	(1.6E-03)	(1.3E+02)	(6.5E-03)	14.0
21A	ANTHRACENE	2.3E+04	1.4E-01	2.4E-04	6.9E+02	3.5E-02	18.0
21A	PHENANTHRENE	2.2E+04	4.6E+00	8.2E-03	6.6E+02	3.4E-02	9.0
21A	9-METHYLANTHRACENE	4.3E+03	(9.0E-01)	(1.6E-03)	(1.3E+02)	(6.6E-03)	13.0
21B	BENZ(A)ANTHRACENE	1.2E+03	9.0E+00	1.6E-02	3.6E+01	1.9E-03	8.0
21B	TRIPHENYLENE	4.1E+03	(5.3E+03)	(9.4E+00)	(1.2E+02)	(6.3E-03)	3.0
21B	PYRENE	2.4E+04	3.5E-02	6.3E-05	7.2E+02	3.7E-02	25.0
21C	DIBENZO(A,H)ANTHRACENE	4.0E+02	1.4E+03	2.6E+00	1.2E+01	6.2E-04	6.0
21C	BENZO(A)PYRENE	1.7E+03	2.8E+04	5.1E+01	5.1E+01	2.6E-03	1.0
21C	BENZO(E)PYRENE	1.4E+03	1.5E-01	2.7E-04	4.2E+01	2.2E-03	17.0
22A	FLUORENE	7.5E+03	(5.5E-02)	(9.9E-05)	(2.3E+02)	(1.2E-02)	24.0
22B	FLUORANTHENE	3.4E+04	1.2E-01	2.2E-04	1.0E+03	5.2E-02	21.0
21D	BENZO(G,H,I)PERYLENE	2.0E+02	(1.5E+00)	(2.8E-03)	(6.0E+00)	(3.1E-04)	10.0
22B	BENZO(A)FLUORENE	9.0E+02	(5.8E-03)	(1.0E-05)	(2.7E+01)	(1.4E-03)	31.0
22B	BENZO(B)FLUORENE	6.0E+02	(3.9E-03)	(7.0E-06)	(1.8E+01)	(9.3E-04)	33.0
22C	BENZO(K)FLUORANTHENE	1.0E+03	2.1E-02	3.7E-05	3.0E+01	1.5E-03	28.0
22C	BENZO(B)FLUORANTHENE	1.2E+03	4.6E-01	8.3E-04	3.6E+01	1.9E-03	15.0
22D	INDENO(1,2,3-CD)PYRENE	3.0E+02	6.2E-02	1.1E-04	9.0E+00	4.6E-04	22.0
23B	QUINOLINE	1.1E+03	2.3E-02	4.1E-05	3.3E+01	1.7E-03	27.0
23B	ACRIDINE	4.7E+02	1.7E-03	3.0E-06	1.4E+01	7.2E-04	35.0
23C	INDOLE	8.0E+00	2.5E-04	4.5E-07	2.4E-01	1.2E-05	37.0
23C	CARBAZOLE	1.7E+03	2.4E-02	4.3E-05	5.1E+01	2.6E-03	26.0

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Table 12.4

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
24B	DIBENZOFURAN	8.1E+03	7.8E-03	1.4E-05	2.4E+02	1.2E-02	30.0
25B	BENZOTHIOPHENE	8.7E+03	1.2E-01	2.2E-04	2.6E+02	1.3E-02	20.0

SUM OF DS INCLUDING ALL COMPOUNDS = 5.1E+04 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 1.5E+03
SUM OF DS EXCLUDING SOME COMPOUNDS= 4.5E+04 SUM OF WDS/CR EXCLUDING SOME COMPOUNDS= 1.3E+03

SUM OF WDS INCLUDING ALL COMPOUNDS =9.1E+01 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 7.8E-02
SUM OF WDS EXCLUDING SOME COMPOUNDS=8.0E+01 SUM OF WDS/ER EXCLUDING SOME COMPOUNDS= 6.9E-02

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TABLE 12.5 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #41

Coal Type: W. Kentucky #9

Stream Description: Ash (Discharge)

Stream Flow Rate: _____ m^3/s, _____ ℓ/s, 2.61E-2 g/s

Coal Feed Rate (CR): 5.95E-2 g/s (2.36E-4 tph)

Product Flow Rate: 2.00E-4 Nm^3/s (25.4 SCFH)

Product Heating Value: 5.81E6 J/Nm^3 (156 Btu/SCF)

Energy Production Rate (ER): 1160 J/s (3960 Btu/hr)

Table 12.5 Continued RTI RUN NUMBER - 41 STREAM - ASH

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
49A	ARSENIC	7.2E+00	1.8E+01	8.7E-02	5.8E-01	3.0E-05	1.0
54A	SELENIUM	9.9E+00	5.8E+00	2.8E-02	8.0E-01	4.1E-05	2.0
57A	CHLORIDE	1.0E-01	3.8E-07	1.8E-09	8.1E-03	4.1E-07	4.0
82A	CADMIUM	1.8E+00	1.8E-01	8.7E-04	1.5E-01	7.5E-06	3.0

SUM OF DS INCLUDING ALL COMPOUNDS = 2.4E+01 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 1.9E+00

SUM OF WDS INCLUDING ALL COMPOUNDS =1.2E-01 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 1.0E-04

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Table 12.6

RTI RUN NUMBER - 41 STREAM - GAS

STREAM FLOW RATE = 1.1E-01 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	42B	CARBON MONOXIDE	1000.
2.0	15A	BENZENE	1000.
3.0	53B	HYDROGEN SULFIDE	100.
4.0	53C	CARBONYL SULFIDE	10.
5.0	99A	HYDROGEN	10.
6.0	42B	CARBON DIOXIDE	10.
7.0	13A	C2H6S	10.
8.0	25A	THIOPHENE	10.
9.0	21A	NAPHTHALENE	10.
10.0	01A	METHANE	10.
11.0	13A	METHANETHIOL	10.
12.0	18A	PHENOL	10.
13.0	25A	METHYLTHIOPHENE	1.
14.0	15B	INDENE	1.
15.0	18A	CRESOLS	1.
16.0	15A	BIPHENYL	1.
17.0	15A	TOLUENE	1.
18.0	15A	C4-BENZENE	1.

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Table 12.7

RTI RUN NUMBER - 41 STREAM - CONDENSATE

STREAM FLOW RATE = 6.5E-02 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	18A	CRESOLS	100000.
2.0	18A	XYLENOLS	10000.
3.0	18A	PHENOL	10.

Table 12.8

RTI RUN NUMBER - 41 STREAM - TAR

STREAM FLOW RATE = 1.8E-03 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	21C	BENZO(A)PYRENE	10000.
2.0	18A	CRESOLS	10000.
3.0	21B	TRIPHENYLENE	10000.
4.0	18A	XYLENOLS	1000.
5.0	18A	TRIMETHYLPHENOL	1000.
6.0	21C	DIBENZO(A,H)ANTHRACENE	1000.
7.0	18A	O-ISOPROPYLPHENOL	1000.
8.0	21B	BENZ(A)ANTHRACENE	10.
9.0	21A	PHENANTHRENE	1.
10.0	21D	BENZO(G,H,I)PERYLENE	1.
11.0	21A	ACENAPHTHYLENE	1.

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Table 12.9 RTI RUN NUMBER - 41 STREAM - ASH

STREAM FLOW RATE = 4.8E-03 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	49A	ARSENIC	10.
2.0	54A	SELENIUM	10.

Table 12.10 RTI RUN NUMBER - 41 STREAM - GAS

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	42B	CARBON MONOXIDE	3.0E-01
2.0	15A	BENZENE	6.9E-02
3.0	53B	HYDROGEN SULFIDE	3.0E-02
4.0	53C	CARBONYL SULFIDE	2.5E-03
5.0	99A	HYDROGEN	2.2E-03
6.0	42B	CARBON DIOXIDE	2.0E-03
7.0	13A	C2H6S	1.9E-03
8.0	25A	THIOPHENE	9.8E-04
9.0	21A	NAPHTHALENE	7.1E-04
10.0	01A	METHANE	6.7E-04
11.0	13A	METHANETHIOL	6.3E-04
12.0	18A	PHENOL	3.2E-04
13.0	25A	METHYLTHIOPHENE	2.4E-04
14.0	15B	INDENE	1.8E-04
15.0	18A	CRESOLS	1.8E-04
16.0	15A	BIPHENYL	9.5E-05
17.0	15A	TOLUENE	7.3E-05
18.0	15A	C4-BENZENE	6.3E-05

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Table 12.11 RTI RUN NUMBER - 41 STREAM - CONDENSATE

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	18A	CRESOLS	2.7E+00
2.0	18A	XYLENOLS	3.8E-01
3.0	18A	PHENOL	8.8E-04

Table 12.12 RTI RUN NUMBER - 41 STREAM - TAR

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	21C	BENZO(A)PYRENE	3.0E-02
2.0	18A	CRESOLS	9.2E-03
3.0	21B	TRIPHENYLENE	5.6E-03
4.0	18A	XYLENOLS	5.1E-03
5.0	18A	TRIMETHYLPHENOL	1.8E-03
6.0	21C	DIBENZO(A,H)ANTHRACENE	1.5E-03
7.0	18A	O-ISOPROPYLPHENOL	7.7E-04
8.0	21B	BENZ(A)ANTHRACENE	9.5E-06
9.0	21A	PHENANTHRENE	4.9E-06
10.0	21B	BENZO(G,H,I)PERYLENE	1.6E-06
11.0	21A	ACENAPHTHYLENE	1.3E-06

Table 12.13 RTI RUN NUMBER - 41 STREAM - ASH

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	49A	ARSENIC	5.2E-05
2.0	54A	SELENIUM	1.7E-05

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Table 12.11 RTI RUN NUMBER - 41 STREAM - CONDENSATE

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	18A	CRESOLS	2.7E+00
2.0	18A	XYLENOLS	3.8E-01
3.0	18A	PHENOL	8.8E-04

Table 12.12 RTI RUN NUMBER - 41 STREAM - TAR

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	21C	BENZO(A)PYRENE	3.0E-02
2.0	18A	CRESOLS	9.2E-03
3.0	21B	TRIPHENYLENE	5.6E-03
4.0	18A	XYLENOLS	5.1E-03
5.0	18A	TRIMETHYLPHENOL	1.8E-03
6.0	21C	DIBENZO(A,H)ANTHRACENE	1.5E-03
7.0	18A	O-ISOPROPYLPHENOL	7.7E-04
8.0	21B	BENZ(A)ANTHRACENE	9.5E-06
9.0	21A	PHENANTHRENE	4.9E-06
10.0	21B	BENZO(G,H,I)PERYLENE	1.6E-06
11.0	21A	ACENAPHTHYLENE	1.3E-06

Table 12.13 RTI RUN NUMBER - 41 STREAM - ASH

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	49A	ARSENIC	5.2E-05
2.0	54A	SELENIUM	1.7E-05

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TABLE 13-1 SUMMARY DISCHARGE SEVERITY MEASURES FOR SYNTHETIC FUEL PROCESSES

Process: RTI #43 Product Flow Rate: 5.57E-4 Nm^3/s (70.8 SCF/hr)

Coal Type: ND Beulah/Zap Lignite Product Heating Value: 5.25E6 J/Nm^3 (141 Btu/SCF)

Coal Rate (CR): 2.53E-1 g/s (1.00E-3 T/hr) Energy Production Rate (ER): 2930 J/s (1.0E4 Btu/hr)

Stream	Stream Flow Rate	$\sum$DS	$\sum$WDS	$\sum$WDS/CR	$\sum$WDS/ER	No. Compounds Identified	No. Compounds with DS≥1
Gas	2.6E-1 g/s	7.3E3	1.9E-3 g/s	7.5E3 g/g	6.5E-1 g/J	34	14
Condensate	1.1E-1 g/s	3.6E5	4.2E4 g/s	1.6E5 g/g	1.4E1 g/J	17	6
Tar	1.8E-3 g/s	1.6E5	3.0E2 g/s	1.2E3 g/g	1.0E-1 g/J	39	9
Ash	2.2E-2 g/s	2.1E4	4.8E2 g/s	1.9E3 g/g	1.6E-1 g/J	6	4

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TABLE 13.2 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #43

Coal Type: ND Beulah/Zap Lignite

Stream Description: Gas (Product)

Stream Flow Rate: 5.57E-4 Nm^3/s, ——— ℓ/s, 2.6E-1 g/s

Coal Feed Rate (CR): 2.53E-1 g/s (1.00E-3 tph)

Product Flow Rate: 5.57E-4 Nm^3/s (70.8 SCFH)

Product Heating Value: 5.25E6 J/Nm^3 (141 Btu/SCF)

Energy Production Rate (ER): 2930 J/s (1.00E4 Btu/hr)

continued

Table 13.2 Continued RTI RUN NUMBER - 43 STREAM - GAS

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
01A	METHANE	1.7E+07	5.2E+00	1.4E+00	3.7E+04	3.2E+00	9.0
13A	METHANETHIOL	5.0E+03	5.0E+00	1.3E+00	1.1E+01	9.5E-04	10.0
13A	C2H6S	6.0E+03	6.0E+00	1.6E+00	1.3E+01	1.1E-03	8.0
15A	BENZENE	7.1E+05	2.4E+02	6.2E+01	1.6E+03	1.4E-01	2.0
15A	TOLUENE	4.1E+05	1.1E+00	2.8E-01	9.0E+02	7.8E-02	13.0
15A	ETHYLBENZENE	2.7E+04	6.1E-02	1.6E-02	5.9E+01	5.1E-03	24.0
15A	XYLENES	1.3E+05	3.0E-01	7.7E-02	2.9E+02	2.5E-02	20.0
15A	BIPHENYL	9.6E+02	9.6E-01	2.5E-01	2.1E+00	1.8E-04	15.0
15B	INDAN	7.8E+03	3.4E-02	8.9E-03	1.7E+01	1.5E-03	25.0
15B	INDENE	1.0E+05	2.2E+00	5.8E-01	2.2E+02	1.9E-02	12.0
15B	XYLENES	3.0E+04	6.8E-02	1.8E-02	6.6E+01	5.7E-03	23.0
15B	METHYLINDENE	6.2E+03	(1.4E-01)	(3.6E-02)	(1.4E+01)	(1.2E-03)	22.0
15B	C3-BENZENES	4.9E+04	(2.2E-01)	(5.8E-02)	(1.1E+02)	(9.3E-03)	21.0
18A	PHENOL	8.3E+03	4.4E-01	1.1E-01	1.8E+01	1.6E-03	19.0
18A	CRESOLS	5.1E+04	2.3E+00	6.1E-01	1.1E+02	9.7E-03	11.0
18A	XYLENOLS	3.6E+02	2.8E-02	7.3E-03	7.9E-01	6.9E-05	27.0
21A	NAPHTHALENE	2.3E+04	4.6E-01	1.2E-01	5.1E+01	4.4E-03	18.0
21A	ALPHA-METHYLNAPHTHALENE	1.2E+03	5.2E-03	1.4E-03	2.6E+00	2.3E-04	31.0
21A	BETA-METHYLNAPHTHALENE	2.1E+03	9.5E-03	2.5E-03	4.6E+00	4.0E-04	29.0
21A	ACENAPHTHENE	4.0E+00	2.5E-04	6.6E-05	8.8E-03	7.6E-07	33.0
21A	ANTHRACENE	1.8E+03	3.2E-02	8.4E-03	4.0E+00	3.4E-04	26.0
21A	PHENANTHRENE	6.9E-01	4.3E-04	1.1E-04	1.5E-03	1.3E-07	32.0
21A	C15H12: 3 RINGS	2.3E+01	(1.4E-02)	(3.8E-03)	(5.1E-02)	(4.4E-06)	28.0
21B	C16H10: 4 RINGS	3.8E+01	(1.5E+02)	(3.8E+01)	(8.4E-02)	(7.2E-06)	3.0
24A	BENZOFURAN	2.8E+04	5.3E-03	1.4E-03	6.2E+01	5.3E-03	30.0
24B	DIBENZOFURAN	3.5E+02	6.6E-05	1.7E-05	7.7E-01	6.7E-05	34.0
25A	THIOPHENE	4.0E+03	8.9E-01	2.3E-01	8.8E+00	7.6E-04	16.0
25A	METHYLTHIOPHENE	1.6E+04	7.0E-01	1.8E-01	3.5E+01	3.0E-03	17.0
42B	CARBON MONOXIDE	2.7E+08	6.8E+03	1.8E+03	5.9E+05	5.1E+01	1.0
42B	CARBON DIOXIDE	1.7E+08	1.9E+01	5.0E+00	3.7E+05	3.2E+01	7.0

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Table 13.2

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/J		DS RANK
					UG/J COAL	UG/J PRODUCT	
53B	HYDROGEN SULFIDE	6.4E+05	4.3E+01	1.1E+01	1.4E+03	1.2E-01	4.0
53C	CARBONYL SULFIDE	1.2E+05	3.2E+01	8.3E+00	2.6E+02	2.3E-02	5.0
53D	CARBON DISULFIDE	3.0E+03	1.0E+00	2.6E-01	6.6E+00	5.7E-04	14.0
99A	HYDROGEN	1.1E+07	(2.7E+01)	(7.0E+00)	(2.4E+04)	(2.1E+00)	6.0
SUM OF DS INCLUDING ALL COMPOUNDS = 7.3E+03			SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 7.5E+03				
SUM OF DS EXCLUDING SOME COMPOUNDS= 7.1E+03			SUM OF WDS/CR EXCLUDING SOME COMPOUNDS= 7.4E+03				
SUM OF WDS INCLUDING ALL COMPOUNDS =1.9E+03			SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 6.5E-01				
SUM OF WDS EXCLUDING SOME COMPOUNDS=1.9E+03			SUM OF WDS/ER EXCLUDING SOME COMPOUNDS= 6.4E-01				

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TABLE 13-3 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #43

Coal Type: ND Beulah/Zap Lignite

Stream Description: Condensate (Discharge)

Stream Flow Rate: ____ m^3/s, 1.15E-4 ℓ/s, 1.15E-1 g/s

Coal Feed Rate (CR): 2.53E-1 g/s (1.00E-3 tph)

Product Flow Rate: 5.57E-4 Nm^3/s (70.8 SCFH)

Product Heating Value: 5.25E6 J/Nm^3 (141 Btu/SCF)

Energy Production Rate (ER): 2930 J/s (1.00E4 Btu/hr)

continued

Table 13.3RTI RUN NUMBER - 43 STREAM - CONDENSATE

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	PRODUCTION FACTORS UG/J PRODUCT	DS RANK
18A	PHENOL	2.7E+06	1.6E+02	1.8E+01	1.2E+03	1.1E-01	3.0
18A	CRESOLS	1.5E+06	3.0E+05	3.4E+04	6.8E+02	5.9E-02	1.0
18A	XYLENOLS	3.1E+05	6.2E+04	7.1E+03	1.4E+02	1.2E-02	2.0
21A	1-METHYLNAPHTHALENE	4.8E+02	1.4E-04	1.6E-05	2.2E-01	1.9E-05	12.0
21A	2-METHYLNAPHTHALENE	2.2E+02	6.5E-05	7.4E-06	1.0E-01	8.6E-06	15.0
21A	ANTHRACENE	4.1E+01	4.9E-05	5.6E-06	1.9E-02	1.6E-06	16.0
21A	PHENANTHRENE	9.6E+01	4.0E-03	4.6E-04	4.3E-02	3.8E-06	8.0
21A	ACENAPHTHYLENE	5.7E+01	(2.4E-03)	(2.7E-04)	(2.6E-02)	(2.2E-06)	10.0
21B	CHRYSENE	1.6E+02	4.8E-03	5.6E-04	7.2E-02	6.3E-06	7.0
21B	TRIPHENYLENE	5.0E+01	(1.3E+01)	(1.5E+00)	(2.3E-02)	(2.0E-06)	6.0
22A	FLUORENE	5.7E+01	(8.4E-05)	(9.6E-06)	(2.6E-02)	(2.2E-06)	13.0
22B	FLUORANTHENE	2.8E+01	2.0E-05	2.3E-06	1.3E-02	1.1E-06	17.0
21C	BENZO(A)PYRENE	3.6E+01	1.2E+02	1.4E+01	1.6E-02	1.4E-06	4.0
21C	BENZO(E)PYRENE	2.1E+01	4.6E-04	5.2E-05	9.5E-03	8.2E-07	11.0
21C	PERYLENE	2.1E+01	(7.0E+01)	(8.0E+00)	(9.5E-03)	(8.2E-07)	5.0
22C	BENZO(K)FLUORANTHENE	1.7E+01	7.1E-05	8.1E-06	7.7E-03	6.7E-07	14.0
22C	BENZO(B)FLUORANTHENE	3.3E+01	2.5E-03	2.9E-04	1.5E-02	1.3E-06	9.0

SUM OF DS INCLUDING ALL COMPOUNDS = 3.6E+05
SUM OF DS EXCLUDING SOME COMPOUNDS= 3.6E+05

SUM OF WDS INCLUDING ALL COMPOUNDS =4.2E+04
SUM OF WDS EXCLUDING SOME COMPOUNDS=4.2E+04

SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 1.6E+05
SUM OF WDS/CR EXCLUDING SOME COMPOUNDS= 1.6E+05

SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 1.4E+01
SUM OF WDS/ER EXCLUDING SOME COMPOUNDS= 1.4E+01

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TABLE 13.4 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #43

Coal Type: ND Beulah/Zap Lignite

Stream Description: Tar (Byproduct)

Stream Flow Rate: _____ m^3/s, 1.86E-6 ℓ/s, 1.9E-3 g/s

Coal Feed Rate (CR): 2.53E-1 g/s (1.00E-3 tph)

Product Flow Rate: 5.57E-4 Nm^3/s (70.8 SCFH)

Product Heating Value: 5.25E6 J/Nm^3 (141 Btu/SCF)

Energy Production Rate (ER): 2930 J/s (1.00E4 Btu/hr)

continued

Table 13.4 Continued RTI RUN NUMBER - 43 STREAM - TAR

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	PRODUCTION FACTORS UG/J PRODUCT	DS RANK
10C	ANILINE	3.8E+00	6.3E-05	1.2E-07	2.7E-02	2.4E-06	39.0
10C	BENZIDINE	2.0E+02	6.7E-02	1.2E-04	1.4E+00	1.2E-04	17.0
15A	BIPHENYL	2.1E+03	7.0E-01	1.3E-03	1.5E+01	1.3E-03	12.0
18A	PHENOL	5.1E+03	1.5E+00	2.7E-03	3.7E+01	3.2E-03	9.0
18A	CRESOLS	1.6E+04	1.6E+04	2.9E+01	1.2E+02	1.0E-02	3.0
18A	XYLENOLS	1.2E+05	1.2E+05	2.2E+02	8.6E+02	7.5E-02	1.0
18A	TRIMETHYLPHENOL	2.4E+04	2.4E+04	4.4E+01	1.7E+02	1.5E-02	2.0
18A	O-ISOPROPYLPHENOL	2.9E+03	(2.9E+03)	(5.3E+00)	(2.1E+01)	(1.8E-03)	4.0
21A	NAPHTHALENE	3.6E+03	2.4E-02	4.4E-05	2.6E+01	2.2E-03	20.0
21A	C2-(ALKYL)NAPHTHALENE	7.9E+03	1.2E-02	2.1E-05	5.7E+01	4.9E-03	23.0
21A	1-METHYLNAPHTHALENE	4.9E+03	7.2E-03	1.3E-05	3.5E+01	3.1E-03	26.0
21A	2-METHYLNAPHTHALENE	4.5E+03	6.6E-03	1.2E-05	3.2E+01	2.8E-03	27.0
21A	ACENAPHTHYLENE	3.1E+03	(6.5E-01)	(1.2E-03)	(2.2E+01)	(1.9E-03)	13.0
21A	ACENAPHTHENE	1.8E+03	(3.8E-01)	(6.8E-04)	(1.3E+01)	(1.1E-03)	15.0
21A	ANTHRACENE	6.7E+03	4.0E-02	7.3E-05	4.8E+01	4.2E-03	18.0
21A	PHENANTHRENE	2.3E+03	4.8E-01	8.7E-04	1.7E+01	1.4E-03	14.0
21A	9-METHYLANTHRACENE	7.6E+01	(1.6E-02)	(2.9E-05)	(5.5E-01)	(4.7E-05)	21.0
21B	BENZ(A)ANTHRACENE	1.0E+02	7.5E-01	1.4E-03	7.2E-01	6.2E-05	11.0
21B	TRIPHENYLENE	1.0E+02	(1.3E+02)	(2.3E-01)	(7.2E-01)	(6.2E-05)	7.0
21B	CHRYSENE	5.8E+03	8.8E-01	1.6E-03	4.2E+01	3.6E-03	10.0
21B	PYRENE	1.3E+03	1.9E-03	3.5E-06	9.4E+00	8.1E-04	34.0
21C	DIBENZO(A,H)ANTHRACENE	2.0E+01	7.1E+01	1.3E-01	1.4E-01	1.2E-05	8.0
21C	BENZO(A)PYRENE	2.0E+01	3.3E+02	6.1E-01	1.4E-01	1.2E-05	6.0
21C	BENZO(E)PYRENE	1.0E+01	1.1E-03	2.0E-06	7.2E-02	6.2E-06	35.0
21C	PERYLENE	8.6E+01	(1.4E+03)	(2.6E+00)	(6.2E-01)	(5.4E-05)	5.0
22A	FLUORENE	4.0E+03	(2.9E-02)	(5.4E-05)	(2.9E+01)	(2.5E-03)	19.0
22B	FLUORANTHENE	1.5E+03	5.4E-03	9.8E-06	1.1E+01	9.3E-04	28.0
21D	BENZO(G,H,I)PERYLENE	2.0E+01	(1.5E-01)	(2.8E-04)	(1.4E-01)	(1.2E-05)	16.0
22B	BENZO(A)FLUORENE	4.0E+02	(2.6E-03)	(4.7E-06)	(2.9E+00)	(2.5E-04)	32.0
22B	BENZO(B)FLUORENE	3.0E+02	(1.9E-03)	(3.6E-06)	(2.2E+00)	(1.9E-04)	33.0
22C	BENZO(K)FLUORANTHENE	2.0E+01	4.2E-04	7.6E-07	1.4E-01	1.2E-05	37.0
22C	BENZO(B)FLUORANTHENE	3.0E+01	1.2E-02	2.1E-05	2.2E-01	1.9E-05	24.0
22D	INDENO(1,2,3-CD)PYRENE	2.0E+01	4.2E-03	7.6E-06	1.4E-01	1.2E-05	31.0
23B	QUINOLINE	2.5E+02	5.2E-03	9.5E-06	1.8E+00	1.6E-04	29.0
23B	ACRIDINE	2.5E+01	8.9E-05	1.6E-07	1.8E-01	1.6E-05	38.0

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Table 13.4

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
23C	INDOLE	2.4E+01	7.5E-04	1.4E-06	1.7E-01	1.5E-05	36.0
23C	CARBAZOLE	9.0E+02	1.3E-02	2.3E-05	6.5E+00	5.6E-04	22.0
24B	DIBENZOFURAN	4.7E+03	4.5E-03	8.2E-06	3.4E+01	2.9E-03	30.0
25B	BENZOTHIOPHENE	7.0E+02	1.0E-02	1.8E-05	5.0E+00	4.4E-04	25.0

SUM OF DS INCLUDING ALL COMPOUNDS = 1.6E+05 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 1.2E+03
SUM OF DS EXCLUDING SOME COMPOUNDS= 1.6E+05 SUM OF WDS/CR EXCLUDING SOME COMPOUNDS= 1.2E+03

SUM OF WDS INCLUDING ALL COMPOUNDS =3.0E+02 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 1.0E-01
SUM OF WDS EXCLUDING SOME COMPOUNDS=2.9E+02 SUM OF WDS/ER EXCLUDING SOME COMPOUNDS= 1.0E-01

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TABLE 13.5 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #43

Coal Type: ND Beulah/Zap Lignite

Stream Description: Ash (Discharge)

Stream Flow Rate: ——— m^3/s, ——— ℓ/s, 2.24E-2 g/s

Coal Feed Rate (CR): 2.53E-1 g/s (1.00E-3 tph)

Product Flow Rate: 5.57E-4 Nm^3/s (70.8 SCFH)

Product Heating Value: 5.25E6 J/Nm^3 (141 Btu/SCF)

Energy Production Rate (ER): 2930 J/s (1.00E4 Btu/hr)

Table 13.5 RTI RUN NUMBER - 43 STREAM - ASH

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
32A	BERYLLIUM	1.8E+00	1.1E+00	2.4E-02	1.6E-01	1.4E-05	4.0
46A	LEAD	3.0E-01	6.0E-03	1.3E-04	2.7E-02	2.3E-06	6.0
49A	ARSENIC	3.1E+01	7.8E+01	1.7E+00	2.7E+00	2.4E-04	2.0
54A	SELENIUM	8.6E+00	5.1E+00	1.1E-01	7.6E-01	6.6E-05	3.0
68A	CHROMIUM	3.4E+03	2.1E+04	4.8E+02	3.0E+02	2.6E-02	1.0
82A	CADMIUM	5.8E-01	5.8E-02	1.3E-03	5.1E-02	4.4E-06	5.0

SUM OF DS INCLUDING ALL COMPOUNDS = 2.1E+04 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 1.9E+03

SUM OF WDS INCLUDING ALL COMPOUNDS =4.8E+02 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 1.6E-01

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Table 13.6 RTI RUN NUMBER - 43 STREAM - GAS

STREAM FLOW RATE = 2.6E-01 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	42B	CARBON MONOXIDE	10000.
2.0	15A	BENZENE	100.
3.0	21B	C16H10: 4 RINGS	100.
4.0	53B	HYDROGEN SULFIDE	10.
5.0	53C	CARBONYL SULFIDE	10.
6.0	99A	HYDROGEN	10.
7.0	42B	CARBON DIOXIDE	10.
8.0	13A	C2H6S	10.
9.0	01A	METHANE	10.
10.0	13A	METHANETHIOL	10.
11.0	18A	CRESOLS	1.
12.0	15B	INDENE	1.
13.0	15A	TOLUENE	1.
14.0	53D	CARBON DISULFIDE	1.

6-1/2"

Table 13.7 RTI RUN NUMBER - 43 STREAM - CONDENSATE

STREAM FLOW RATE = 1.1E-01 GM/SEC

9-1/8"

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	18A	CRESOLS	100000.
2.0	18A	XYLENOLS	100000.
3.0	18A	PHENOL	100.
4.0	21C	BENZO(A)PYRENE	100.
5.0	21C	PERYLENE	100.
6.0	21B	TRIPHENYLENE	10.

Table 13.8 RTI RUN NUMBER - 43 STREAM - TAR

STREAM FLOW RATE = 1.8E-03 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	18A	XYLENOLS	100000.
2.0	18A	TRIMETHYLPHENOL	10000.
3.0	18A	CRESOLS	10000.
4.0	18A	O-ISOPROPYLPHENOL	1000.
5.0	21C	PERYLENE	1000.
6.0	21C	BENZO(A)PYRENE	100.
7.0	21B	TRIPHENYLENE	100.
8.0	21C	DIBENZO(A,H)ANTHRACENE	100.
9.0	18A	PHENOL	1.

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Table 13.9 RTI RUN NUMBER - 43 STREAM - ASH

STREAM FLOW RATE = 2.2E-02 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	68A	CHROMIUM	10000.
2.0	49A	ARSENIC	100.
3.0	54A	SELENIUM	10.
4.0	32A	BERYLLIUM	1.

Table 13.10 RTI RUN NUMBER - 43 STREAM - GAS

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	42B	CARBON MONOXIDE	3.8E-01
2.0	15A	BENZENE	1.3E-02
3.0	21B	C16H10: 4 RINGS	8.3E-03
4.0	53B	HYDROGEN SULFIDE	2.4E-03
5.0	53C	CARBONYL SULFIDE	1.8E-03
6.0	99A	HYDROGEN	1.5E-03
7.0	42B	CARBON DIOXIDE	1.1E-03
8.0	13A	C2H6S	3.4E-04
9.0	01A	METHANE	2.9E-04
10.0	13A	METHANETHIOL	2.8E-04
11.0	18A	CRESOLS	1.3E-04
12.0	15B	INDENE	1.3E-04
13.0	15A	TOLUENE	6.1E-05
14.0	53D	CARBON DISULFIDE	5.6E-05

Table 13.11 RTI RUN NUMBER - 43 STREAM - CONDENSATE

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	18A	CRESOLS	7.4E+00
2.0	18A	XYLENOLS	1.5E+00
3.0	18A	PHENOL	3.9E-03
4.0	21C	BENZO(A)PYRENE	3.0E-03
5.0	21C	PERYLENE	1.7E-03
6.0	21B	TRIPHENYLENE	3.2E-04

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Table 13.12 RTI RUN NUMBER - 43 STREAM - TAR

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	18A	XYLENOLS	4.7E-02
2.0	18A	TRIMETHYLPHENOL	9.4E-03
3.0	18A	CRESOLS	6.3E-03
4.0	18A	O-ISOPROPYLPHENOL	1.1E-03
5.0	21C	FERYLENE	5.6E-04
6.0	21C	BENZO(A)PYRENE	1.3E-04
7.0	21B	TRIPHENYLENE	5.0E-05
8.0	21C	DIBENZO(A,H)ANTHRACENE	2.8E-05
9.0	18A	PHENOL	5.9E-07

Table 13.13 RTI RUN NUMBER - 43 STREAM - ASH

6-1/2"

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	68A	CHROMIUM	1.0E-01
2.0	49A	ARSENIC	3.7E-04
3.0	54A	SELENIUM	2.4E-05
4.0	32A	BERYLLIUM	5.1E-06

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TABLE 14.1 SUMMARY DISCHARGE SEVERITY MEASURES FOR SYNTHETIC FUEL PROCESSES

Process: RTI #48 Product Flow Rate: 6.25E-4 Nm^3/s (79.4 SCF/hr)

Coal Type: PA. Bottom Red Ash Anthracite Product Heating Value: 3.5E6 J/Nm^3 (94 Btu/SCF)

Coal Rate (CR): 1.34E-1 g/s (5.32E-4 T/hr) Energy Production Rate (ER): 2190 J/s (7470 Btu/hr)

Stream	Stream Flow Rate	$\sum_{DS}$	$\sum_{WDS}$	$\sum_{WDS/CR}$	$\sum_{WDS/ER}$	No. Compounds Identified	No. Compounds with DS≥1
Gas	3.0E-1 g/s	5.5E3	1.7E3 g/s	1.2E4 g/g	7.6E1 g/J	14	8
Condensate	9.4E-2 g/s	1.4E4	1.3E3 g/s	9.7E3 g/g	5.9E-1 g/J	5	5
Ash	2.6E-2 g/s	1.5E-6	4.0E-8 g/s	3.0E-7 g/g	1.8E-11 g/J	1	0

TABLE 14.2 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #48

Coal Type: PA Bottom Red Ash Anthracite

Stream Description: Gas (Product)

Stream Flow Rate: 6.25E-4 Nm^3/s, _____ L/s, 3.0E-1 g/s

Coal Feed Rate (CR): 1.34E-1 g/s (5.32E-4 tph)

Product Flow Rate: 6.25E-4 Nm^3/s (79.4 SCFH)

Product Heating Value: 3.5E6 J/Nm^3 (94 Btu/SCF)

Energy Production Rate (ER): 2190 J/s (7470 Btu/hr)

Table 14.2 Continued

RTI RUN NUMBER - 48 STREAM - GAS

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
01A	METHANE	5.7E+06	1.7E+00	5.3E-01	2.7E+04	1.6E+00	8.0
15A	BENZENE	7.0E+03	2.3E+00	7.1E-01	3.3E+01	2.0E-03	7.0
15A	TOLUENE	3.7E+03	9.7E-03	3.0E-03	1.7E+01	1.1E-03	12.0
15A	BIPHENYL	1.3E+02	1.3E-01	4.0E-02	6.1E-01	3.7E-05	9.0
21A	NAPHTHALENE	2.2E+03	4.4E-02	1.3E-02	1.0E+01	6.3E-04	11.0
21A	ANTHRACENE	1.8E+02	3.2E-03	9.8E-04	8.4E-01	5.1E-05	13.0
21A	PHENANTHRENE	1.9E+02	1.2E-01	3.6E-02	8.9E-01	5.4E-05	10.0
24B	DIBENZOFURAN	1.0E+02	1.9E-05	5.7E-06	4.7E-01	2.9E-05	14.0
42B	CARBON MONOXIDE	2.1E+08	5.3E+03	1.6E+03	9.8E+05	6.0E+01	1.0
42B	CARBON DIOXIDE	2.6E+08	2.9E+01	8.8E+00	1.2E+06	7.4E+01	4.0
47B	AMMONIA	3.0E+05	1.7E+01	5.1E+00	1.4E+03	8.6E-02	6.0
53B	HYDROGEN SULFIDE	1.2E+06	8.0E+01	2.4E+01	5.6E+03	3.4E-01	2.0
53C	CARBONYL SULFIDE	2.1E+05	5.5E+01	1.7E+01	9.8E+02	6.0E-02	3.0
99A	HYDROGEN	9.8E+06	(2.4E+01)	(7.3E+00)	(4.6E+04)	(2.8E+00)	5.0

SUM OF DS INCLUDING ALL COMPOUNDS = 5.5E+03
SUM OF DS EXCLUDING SOME COMPOUNDS= 5.4E+03

SUM OF WDS INCLUDING ALL COMPOUNDS =1.7E+03
SUM OF WDS EXCLUDING SOME COMPOUNDS=1.7E+03

SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 1.2E+04
SUM OF WDS/CR EXCLUDING SOME COMPOUNDS= 1.2E+04

SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 7.6E-01
SUM OF WDS/ER EXCLUDING SOME COMPOUNDS= 7.6E-01

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TABLE 14.3 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #48

Coal Type: PA Bottom Red Ash Anthracite

Stream Description: Condensate (Discharge)

Stream Flow Rate: _____ m^3/s, 9.42E-5 L/s, 9.42E-2 g/s

Coal Feed Rate (CR): 1.34E-1 g/s (5.32E-4 tph)

Product Flow Rate: 6.25E-4 Nm^3/s (79.4 SCFH)

Product Heating Value: 3.5E6 J/Nm^3 (94 Btu/SCF)

Energy Production Rate (ER): 2190 J/s (7470 Btu/hr)

Table 14.3 Continued RTI RUN NUMBER - 48 STREAM - CONDENSATE

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
18A	PHENOL	1.8E+04	1.1E+00	1.0E-01	1.3E+01	7.8E-04	5.0
18A	CRESOLS	2.9E+04	5.8E+03	5.5E+02	2.0E+01	1.2E-03	2.0
18A	XYLENOLS	3.0E+04	6.0E+03	5.7E+02	2.1E+01	1.3E-03	1.0
47A	CYANIDE	3.0E+04	3.0E+01	2.8E+00	2.1E+01	1.3E-03	4.0
47B	AMMONIA	4.9E+06	2.0E+03	1.8E+02	3.4E+03	2.1E-01	3.0

SUM OF DS INCLUDING ALL COMPOUNDS = 1.4E+04 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 9.7E+03

SUM OF WDS INCLUDING ALL COMPOUNDS =1.3E+03 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 5.9E-01

TABLE 14.4 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #48

Coal Type: PA Bottom Red Ash Anthracite

Stream Description: Ash (Discharge)

Stream Flow Rate: _____ m^3/s, _____ ℓ/s, 2.6E-2 g/s

Coal Feed Rate (CR): 1.34E-1 g/s (5.32E-4 tph)

Product Flow Rate: 6.25E-4 Nm^3/s (79.4 SCFH)

Product Heating Value: 3.5E6 J/Nm^3 (94 Btu/SCF)

Energy Production Rate (ER): 2190 J/s (7470 Btu/hr)

Table 14.4 Continued RTI RUN NUMBER - 48 STREAM - ASH

	CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
57A CHLORIDE	4.0E-01	1.5E-06	4.0E-08	7.8E-02	4.8E-06	1.0

SUM OF DS INCLUDING ALL COMPOUNDS = 1.5E-06 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 3.0E-07

SUM OF WDS INCLUDING ALL COMPOUNDS =4.0E-08 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 1.8E-11

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Table 14.5 RTI RUN NUMBER - 48 STREAM - GAS

STREAM FLOW RATE = 3.0E-01 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	42B	CARBON MONOXIDE	10000.
2.0	53B	HYDROGEN SULFIDE	100.
3.0	53C	CARBONYL SULFIDE	100.
4.0	42B	CARBON DIOXIDE	10.
5.0	99A	HYDROGEN	10.
6.0	47B	AMMONIA	10.
7.0	15A	BENZENE	1.
8.0	01A	METHANE	1.

Table 14.6 RTI RUN NUMBER - 48 STREAM - CONDENSATE

STREAM FLOW RATE = 9.4E-02 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	18A	XYLENOLS	10000.
2.0	18A	CRESOLS	10000.
3.0	47B	AMMONIA	1000.
4.0	47A	CYANIDE	10.
5.0	18A	PHENOL	1.

Table 14.7 RTI RUN NUMBER - 48 STREAM - ASH

STREAM FLOW RATE = 2.6E-02 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE

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TABLE 14.8 RTI RUN NUMBER - 48 STREAM - GAS

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	42B	CARBON MONOXIDE	3.9E-01
2.0	53B	HYDROGEN SULFIDE	5.9E-03
3.0	53C	CARBONYL SULFIDE	4.1E-03
4.0	42B	CARBON DIOXIDE	2.1E-03
5.0	99A	HYDROGEN	1.8E-03
6.0	47B	AMMONIA	1.2E-03
7.0	15A	BENZENE	1.7E-04
8.0	01A	METHANE	1.3E-04

Table 14.9 RTI RUN NUMBER - 48 STREAM - CONDENSATE

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	18A	XYLENOLS	1.4E-01
2.0	18A	CRESOLS	1.3E-01
3.0	47B	AMMONIA	4.5E-02
4.0	47A	CYANIDE	6.9E-04
5.0	18A	PHENOL	2.4E-05

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Table 14.10 RTI RUN NUMBER - 48 STREAM - ASH

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)

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TABLE 15.1 SUMMARY DISCHARGE SEVERITY MEASURES FOR SYNTHETIC FUEL PROCESSES

Process: RTI #50 Product Flow Rate: 8.40E-4 Nm^3/s (107 SCF/hr)

Coal Type: Illinois #6 Product Heating Value: 3.46E6 J/Nm^3 (93 Btu/SCF)

Coal Rate (CR): 2.57E-1 g/s (1.02E-3 T/hr) Energy Production Rate (ER): 2910 J/s (9930 Btu/hr)

Stream	Stream Flow Rate	$\sum$DS	$\sum$WDS	$\sum$WDS/CR	$\sum$WDS/ER	No. Compounds Identified	No. Compounds with DS≥1
Gas	3.9E-1 g/s	5.1E3	2.0E3 g/s	7.8E3 g/g	6.8E-1 g/J	33	19
Condensate	1.3E-1 g/s	3.8E5	4.9E4 g/s	1.9E5 g/g	1.7E1 g/J	18	9
Tar	1.4E-2 g/s	2.1E4	2.8E2 g/s	1.1E3 g/g	9.8E-2 g/J	48	13
Ash	5.9E-2 g/s	1.5E4	8.0E2 g/s	3.5E3 g/g	3.1E-1 g/J	23	6

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TABLE 15.2 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #50

Coal Type: Illinois #6

Stream Description: Gas (Product)

Stream Flow Rate: 8.40E-4 Nm^3/s, ____ ℓ/s, 3.9E-1 g/s

Coal Feed Rate (CR): 2.57E-1 g/s (1.02E-3 tph)

Product Flow Rate: 8.40E-4 Nm^3/s (107 SCFH)

Product Heating Value: 3.46E6 J/Nm^3 (93 Btu/SCF)

Energy Production Rate (ER): 2910 J/s (9930 Btu/hr)

continued

Table 15.2 Continued

RTI RUN NUMBER - 50 STREAM - GAS

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	PRODUCTION FACTORS UG/J PRODUCT	DS RANK
01A	METHANE	1.5E+07	4.5E+00	1.8E+00	4.9E+04	4.3E+00	11.0
13A	METHANETHIOL	2.3E+04	2.3E+01	9.0E+00	7.5E+01	6.6E-03	7.0
13A	C2H6S	5.0E+03	5.0E+00	1.9E+00	1.6E+01	1.4E-03	10.0
15A	BENZENE	1.3E+06	4.3E+02	1.7E+02	4.2E+03	3.8E-01	2.5
15A	TOLUENE	5.3E+05	1.4E+00	5.4E-01	1.7E+03	1.5E-01	17.0
15A	ETHYLBENZENE	2.5E+04	5.7E-02	2.2E-02	8.2E+01	7.2E-03	25.0
15A	XYLENES	1.2E+05	2.7E-01	1.1E-01	3.9E+02	3.5E-02	22.0
15A	BIPHENYL	2.3E+03	2.3E+00	9.0E-01	7.5E+00	6.6E-04	13.0
15B	INDAN	1.4E+03	6.1E-03	2.4E-03	4.6E+00	4.0E-04	28.0
15B	INDENE	2.8E+04	6.2E-01	2.4E-01	9.2E+01	8.1E-03	21.0
18A	PHENOL	4.0E+04	2.1E+00	8.2E-01	1.3E+02	1.2E-02	14.0
18A	CRESOLS	2.2E+04	1.0E+00	3.9E-01	7.2E+01	6.4E-03	19.0
18A	XYLENOLS	2.1E+04	1.6E+00	6.3E-01	6.9E+01	6.1E-03	16.0
21A	NAPHTHALENE	3.5E+04	7.0E-01	2.7E-01	1.1E+02	1.0E-02	20.0
21A	PHENANTHRENE	2.9E+03	1.8E+00	7.1E-01	9.5E+00	8.4E-04	15.0
24A	BENZOFURAN	5.4E+03	1.0E-03	4.0E-04	1.8E+01	1.6E-03	31.0
24B	DIBENZOFURAN	3.1E+03	5.8E-04	2.3E-04	1.0E+01	8.9E-04	32.0
25A	THIOPHENE	4.3E+04	9.6E+00	3.7E+00	1.4E+02	1.2E-02	9.0
38A	ALUMINUM	1.1E-01	2.1E-05	8.2E-06	3.6E-04	3.2E-08	33.0
42B	CARBON MONOXIDE	1.6E+08	4.0E+03	1.6E+03	5.2E+05	4.6E+01	1.0
42B	CARBON DIOXIDE	2.7E+08	3.0E+01	1.2E+01	8.8E+05	7.8E+01	5.0
47B	AMMONIA	2.5E+04	1.4E+00	5.4E-01	8.2E+01	7.2E-03	18.0
49A	ARSENIC	7.4E+00	3.7E+00	1.4E+00	2.4E-02	2.1E-06	12.0
53B	HYDROGEN SULFIDE	6.5E+06	4.3E+02	1.7E+02	2.1E+04	1.9E+00	2.5
53C	CARBONYL SULFIDE	4.1E+05	1.1E+02	4.2E+01	1.3E+03	1.2E-01	4.0
53D	CARBON DISULFIDE	8.5E+04	2.8E+01	1.1E+01	2.8E+02	2.5E-02	6.0
54A	SELENIUM	2.5E+01	1.2E-01	4.9E-02	8.2E-02	7.2E-06	23.0
58A	BROMINE	1.9E+01	(2.7E-03)	(1.1E-03)	(6.2E-02)	(5.5E-06)	29.0
62A	TITANIUM	1.1E+02	1.8E-02	7.1E-03	3.6E-01	3.2E-05	27.0
71A	MANGANESE	9.6E+00	1.9E-03	7.5E-04	3.1E-02	2.8E-06	30.0
78A	COPPER	8.9E+00	4.4E-02	1.7E-02	2.9E-02	2.6E-06	26.0

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Table 15.2 Continued

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
83A	MERCURY	3.0E+00	5.9E-02	2.3E-02	9.8E-03	8.7E-07	24.0
99A	HYDROGEN	9.4E+06	(2.3E+01)	(8.9E+00)	(3.1E+04)	(2.7E+00)	8.0

SUM OF DS INCLUDING ALL COMPOUNDS = 5.1E+03
SUM OF DS EXCLUDING SOME COMPOUNDS= 5.1E+03

SUM OF WDS INCLUDING ALL COMPOUNDS =2.0E+03
SUM OF WDS EXCLUDING SOME COMPOUNDS=2.0E+03

SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 7.8E+03
SUM OF WDS/CR EXCLUDING SOME COMPOUNDS= 7.7E+03

SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 6.8E-01
SUM OF WDS/ER EXCLUDING SOME COMPOUNDS= 6.8E-01

TABLE 15.3 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #50

Coal Type: Illinois #6

Stream Description: Condensate (Discharge)

Stream Flow Rate: ____ m^3/s, 1.29E-4 ℓ/s, 1.29E1 g/s

Coal Feed Rate (CR): 2.57E-1 g/s (1.02E-3 tph)

Product Flow Rate: 8.40E-4 Nm^3/s (107 SCFH)

Product Heating Value: 3.46E6 J/Nm^3 (93 Btu/SCF)

Energy Production Rate (ER): 2910 J/s (9930 Btu/hr)

continued

Table 15.3 Continued

RTI RUN NUMBER - 50 STREAM - CONDENSATE

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	PRODUCTION FACTORS UG/J PRODUCT	DS RANK
18A	PHENOL	1.8E+06	1.1E+02	1.4E+01	9.0E+02	8.0E-02	6.0
18A	CRESOLS	1.5E+06	3.0E+05	3.9E+04	7.5E+02	6.7E-02	1.0
18A	XYLENOLS	3.7E+05	7.4E+04	9.5E+03	1.9E+02	1.6E-02	2.0
46A	LEAD	4.4E+02	1.8E+00	2.3E-01	2.2E-01	2.0E-05	9.0
47A	CYANIDE	5.9E+02	5.9E-01	7.6E-02	3.0E-01	2.6E-05	10.0
47B	AMMONIA	6.1E+06	2.4E+03	3.1E+02	3.1E+03	2.7E-01	4.0
49A	ARSENIC	1.8E+03	9.0E+02	1.2E+02	9.0E-01	8.0E-05	5.0
50A	ANTIMONY	2.0E+02	2.7E-01	3.5E-02	1.0E-01	8.9E-06	12.0
54A	SELENIUM	8.0E+02	3.6E+01	4.7E+00	4.0E-01	3.5E-05	7.0
57A	CHLORIDES	5.6E+06	4.3E+00	5.6E-01	2.8E+03	2.5E-01	8.0
58A	BROMINE	1.3E+04	1.0E-02	1.3E-03	6.5E+00	5.8E-04	15.0
60A	SCANDIUM	9.7E-02	1.2E-07	1.6E-08	4.9E-05	4.3E-09	18.0
68A	CHROMIUM	2.4E+03	3.0E+03	3.9E+02	1.2E+00	1.1E-04	3.0
72A	IRON	4.8E+00	3.2E-03	4.1E-04	2.4E-03	2.1E-07	17.0
74A	COBALT	9.7E+00	1.3E-02	1.7E-03	4.9E-03	4.3E-07	14.0
78A	COPPER	4.9E+02	9.8E-02	1.3E-02	2.5E-01	2.2E-05	13.0
81A	ZINC	5.4E+02	6.4E-03	8.3E-04	2.7E-01	2.4E-05	16.0
82A	CADMIUM	2.1E+00	4.2E-01	5.4E-02	1.1E-03	9.3E-08	11.0

SUM OF DS INCLUDING ALL COMPOUNDS = 3.8E+05 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 1.9E+05

SUM OF WDS INCLUDING ALL COMPOUNDS =4.9E+04 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 1.7E+01

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TABLE 15.4 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #50

Coal Type: Illinois #6

Stream Description: Tar (Byproduct)

Stream Flow Rate: _____ m^3/s, 1.37E-5 ℓ/s, 1.4E-2 g/s

Coal Feed Rate (CR): 2.57E-1 g/s (1.02E-3 tph)

Product Flow Rate: 8.40E-4 Nm^3/s (107 SCFH)

Product Heating Value: 3.46E6 J/Nm^3 (93 Btu/SCF)

Energy Production Rate (ER): 2910 J/s (9930 Btu/hr)

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Table 15.4 Continued RTI RUN NUMBER - 50 STREAM - TAR

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
10C	BENZIDINE	1.0E+02	3.3E-02	4.6E-04	5.3E+00	4.7E-04	24.0
15A	BIPHENYL	9.0E+02	3.0E-01	4.1E-03	4.8E+01	4.2E-03	15.0
18A	PHENOL	3.0E+03	8.8E-01	1.2E-02	1.6E+02	1.4E-02	14.0
18A	CRESOLS	1.4E+04	1.4E+04	1.9E+02	7.5E+02	6.6E-02	1.0
18A	XYLENOLS	1.1E+03	1.1E+03	1.5E+01	5.9E+01	5.2E-03	3.0
18A	TRIMETHYLPHENOL	1.0E+02	1.0E+02	1.4E+00	5.3E+00	4.7E-04	8.0
18A	O-ISOPROPYLPHENOL	9.0E+02	(9.0E+02)	(1.2E+01)	(4.8E+01)	(4.2E-03)	4.0
21A	NAPHTHALENE	6.9E+03	4.6E-02	6.3E-04	3.7E+02	3.3E-02	23.0
21A	C2-(ALKYL)NAPHTHALENE	2.0E+03	2.9E-03	4.0E-05	1.1E+02	9.4E-03	38.0
21A	1-METHYLNAPHTHALENE	2.2E+03	3.2E-03	4.4E-05	1.2E+02	1.0E-02	37.0
21A	2-METHYLNAPHTHALENE	5.7E+03	8.4E-03	1.1E-04	3.0E+02	2.7E-02	32.0
21A	ACENAPHTHYLENE	5.5E+03	(1.1E+00)	(1.6E-02)	(2.9E+02)	(2.6E-02)	12.0
21A	ACENAPHTHENE	7.0E+02	(1.5E-01)	(2.0E-03)	(3.7E+01)	(3.3E-03)	18.0
21A	ANTHRACENE	1.9E+03	1.1E-02	1.6E-04	1.0E+02	9.0E-03	28.0
21A	PHENANTHRENE	5.1E+03	1.1E+00	1.5E-02	2.7E+02	2.4E-02	13.0
21B	BENZ(A)ANTHRACENE	6.0E+02	4.5E+00	6.1E-02	3.2E+01	2.8E-03	10.0
21B	TRIPHENYLENE	5.0E+02	(6.4E+02)	(8.8E+00)	(2.7E+01)	(2.4E-03)	5.0
21B	CHRYSENE	1.3E+03	2.0E-01	2.7E-03	6.9E+01	6.1E-03	17.0
21B	PYRENE	1.0E+03	1.5E-03	2.0E-05	5.3E+01	4.7E-03	41.0
21C	DIBENZO(A,H)ANTHRACENE	8.0E+01	2.9E+02	3.9E+00	4.3E+00	3.8E-04	7.0
21C	BENZO(A)PYRENE	2.0E+02	3.3E+03	4.6E+01	1.1E+01	9.4E-04	2.0
21C	BENZO(E)PYRENE	1.0E+02	1.1E-02	1.5E-04	5.3E+00	4.7E-04	29.0
21C	PERYLENE	2.0E+01	(3.3E+02)	(4.6E+00)	(1.1E+00)	(9.4E-05)	6.0
22A	FLUORENE	3.1E+03	(2.3E-02)	(3.1E-04)	(1.7E+02)	(1.5E-02)	26.0
22B	FLUORANTHENE	2.5E+03	8.9E-03	1.2E-04	1.3E+02	1.2E-02	31.0
21D	BENZO(G,H,I)PERYLENE	3.0E+01	(2.3E-01)	(3.2E-03)	(1.6E+00)	(1.4E-04)	16.0
22B	BENZO(A)FLUORENE	1.4E+03	(9.1E-03)	(1.2E-04)	(7.5E+01)	(6.6E-03)	30.0
22B	BENZO(B)FLUORENE	6.0E+02	(3.9E-03)	(5.3E-05)	(3.2E+01)	(2.8E-03)	36.0
22C	BENZO(K)FLUORANTHENE	2.0E+02	4.2E-03	5.7E-05	1.1E+01	9.4E-04	34.5
22C	BENZO(B)FLUORANTHENE	3.0E+02	1.2E-01	1.6E-03	1.6E+01	1.4E-03	20.0
22D	INDENO(1,2,3-CD)PYRENE	4.0E+01	8.3E-03	1.1E-04	2.1E+00	1.9E-04	33.0
23B	QUINOLINE	2.0E+02	4.2E-03	5.7E-05	1.1E+01	9.4E-04	34.5
23B	ACRIDINE	2.0E+02	7.1E-04	9.8E-06	1.1E+01	9.4E-04	45.0
23C	CARBAZOLE	1.0E+03	1.4E-02	2.0E-04	5.3E+01	4.7E-03	27.0
24B	DIBENZOFURAN	2.3E+03	2.2E-03	3.0E-05	1.2E+02	1.1E-02	39.0
25B	BENZOTHIOPHENE	2.0E+03	2.9E-02	3.9E-04	1.1E+02	9.4E-03	25.0

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Table 15.4 Continued

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/J		DS RANK
					UG/G COAL	PRODUCT	
46A	LEAD	1.0E-01	2.0E-03	2.7E-05	5.3E-03	4.7E-07	40.0
49A	ARSENIC	2.5E+00	6.2E+00	8.6E-02	1.3E-01	1.2E-05	9.0
50A	ANTIMONY	1.8E-01	1.2E-03	1.7E-05	9.6E-03	8.5E-07	42.0
54A	SELENIUM	6.1E-01	1.4E-01	1.9E-03	3.3E-02	2.9E-06	19.0
58A	BROMINE	1.2E+00	4.6E-06	6.3E-08	6.4E-02	5.7E-06	47.0
60A	SCANDIUM	2.3E-03	1.4E-08	2.0E-10	1.2E-04	1.1E-08	48.0
68A	CHROMIUM	5.0E-01	3.1E+00	4.3E-02	2.7E-02	2.4E-06	11.0
72A	IRON	2.3E-02	7.7E-05	1.1E-06	1.2E-03	1.1E-07	46.0
74A	COBALT	1.1E-01	7.3E-04	1.0E-05	5.9E-03	5.2E-07	44.0
76A	NICKEL	5.0E+00	1.0E-01	1.4E-03	2.7E-01	2.4E-05	21.0
81A	ZINC	1.9E+01	1.1E-03	1.6E-05	1.0E+00	9.0E-05	43.0
83A	MERCURY	1.0E-02	5.0E-02	6.9E-04	5.3E-04	4.7E-08	22.0

SUM OF DS INCLUDING ALL COMPOUNDS = 2.1E+04 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 1.1E+03
SUM OF DS EXCLUDING SOME COMPOUNDS= 1.9E+04 SUM OF WDS/CR EXCLUDING SOME COMPOUNDS= 1.0E+03

SUM OF WDS INCLUDING ALL COMPOUNDS =2.8E+02 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 9.8E-02
SUM OF WDS EXCLUDING SOME COMPOUNDS=2.6E+02 SUM OF WDS/ER EXCLUDING SOME COMPOUNDS= 8.9E-02

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TABLE 15.5 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #50

Coal Type: Illinois #6

Stream Description: Ash (Discharge)

Stream Flow Rate: _____ m^3/s, _____ ℓ/s, 5.93E-2 g/s

Coal Feed Rate (CR): 2.57E-1 g/s (1.02E-3 tph)

Product Flow Rate: 8.40E-4 Nm^3/s (107 SCFH)

Product Heating Value: 3.46E6 J/Nm^3 (93 Btu/SCF)

Energy Production Rate (ER): 2.91E3 J/s (9930 Btu/hr)

continued

Table 15.5 Continued

RTI RUN NUMBER - 50 STREAM - ASH

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	PRODUCTION FACTORS UG/J PRODUCT	DS RANK
30A	RUBIDIUM	5.8E+02	1.6E-03	9.6E-05	1.3E+02	1.2E-02	16.0
32A	BERYLLIUM	2.8E+01	1.6E+01	9.8E-01	6.5E+00	5.7E-04	3.0
33A	MAGNESIUM	5.7E+00	3.2E-05	1.9E-06	1.3E+00	1.2E-04	20.0
38A	ALUMINUM	6.1E+01	3.8E-03	2.3E-04	1.4E+01	1.2E-03	15.0
46A	LEAD	4.9E+01	9.8E-01	5.8E-02	1.1E+01	1.0E-03	7.0
49A	ARSENIC	1.2E+01	3.0E+01	1.8E+00	2.8E+00	2.4E-04	2.0
50A	ANTIMONY	5.9E-01	3.9E-03	2.3E-04	1.4E-01	1.2E-05	14.0
54A	SELENIUM	1.2E+00	7.1E-01	4.2E-02	2.8E-01	2.4E-05	9.0
58A	BROMINE	9.7E+01	(3.7E-04)	(2.2E-05)	(2.2E+01)	(2.0E-03)	18.0
57A	CHLORIDE	5.0E-01	1.9E-06	1.1E-07	1.2E-01	1.0E-05	23.0
60A	SCANDIUM	1.5E+01	9.4E-06	5.6E-07	3.5E+00	3.1E-04	21.0
62A	TITANIUM	1.2E+00	6.7E-06	4.0E-07	2.8E-01	2.4E-05	22.0
65A	VANADIUM	9.8E+01	2.0E-01	1.2E-02	2.3E+01	2.0E-03	12.0
68A	CHROMIUM	2.4E+03	1.5E+04	8.9E+02	5.5E+02	4.9E-02	1.0
71A	MANGANESE	4.2E+02	8.4E+00	5.0E-01	9.7E+01	8.6E-03	4.0
72A	IRON	8.3E+01	2.8E-01	1.6E-02	1.9E+01	1.7E-03	10.0
74A	COBALT	3.2E+01	2.1E-01	1.3E-02	7.4E+00	6.5E-04	11.0
76A	NICKEL	1.3E+02	2.6E+00	1.5E-01	3.0E+01	2.7E-03	5.0
78A	COPPER	2.3E-01	2.3E-04	1.4E-05	5.3E-02	4.7E-06	19.0
82A	CADMIUM	2.3E-01	2.3E-02	1.4E-03	5.3E-02	4.7E-06	13.0
83A	MERCURY	2.0E-01	1.0E+00	5.9E-02	4.6E-02	4.1E-06	6.0
84A	CERIUM	9.1E+01	8.3E-04	4.9E-05	2.1E+01	1.9E-03	17.0
85A	THORIUM	9.8E+01	7.5E-01	4.5E-02	2.3E+01	2.0E-03	8.0

SUM OF DS INCLUDING ALL COMPOUNDS = 1.5E+04
SUM OF DS EXCLUDING SOME COMPOUNDS= 1.5E+04

SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 3.5E+03
SUM OF WDS/CR EXCLUDING SOME COMPOUNDS= 3.5E+03

SUM OF WDS INCLUDING ALL COMPOUNDS =8.9E+02
SUM OF WDS EXCLUDING SOME COMPOUNDS=8.9E+02

SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 3.1E-01
SUM OF WDS/ER EXCLUDING SOME COMPOUNDS= 3.1E-01

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Table 15.6 RTI RUN NUMBER - 50 STREAM - GAS

STREAM FLOW RATE = 3.9E-01 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	42B	CARBON MONOXIDE	1000.
2.5	15A	BENZENE	100.
2.5	53B	HYDROGEN SULFIDE	100.
4.0	53C	CARBONYL SULFIDE	100.
5.0	42B	CARBON DIOXIDE	10.
6.0	53D	CARBON DISULFIDE	10.
7.0	13A	METHANETHIOL	10.
8.0	99A	HYDROGEN	10.
9.0	25A	THIOPHENE	10.
10.0	13A	C2H6S	10.
11.0	01A	METHANE	1.
12.0	49A	ARSENIC	1.
13.0	15A	BIPHENYL	1.
14.0	18A	PHENOL	1.
15.0	21A	PHENANTHRENE	1.
16.0	18A	XYLENOLS	1.
17.0	15A	TOLUENE	1.
18.0	47B	AMMONIA	1.
19.0	18A	CRESOLS	1.

9-1/8"

Table 15.7 RTI RUN NUMBER - 50 STREAM - CONDENSATE

STREAM FLOW RATE = 1.3E-01 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	18A	CRESOLS	100000.
2.0	18A	XYLENOLS	100000.
3.0	68A	CHROMIUM	1000.
4.0	47B	AMMONIA	1000.
5.0	49A	ARSENIC	1000.
6.0	18A	PHENOL	100.
7.0	54A	SELENIUM	10.
8.0	57A	CHLORIDES	1.
9.0	46A	LEAD	1.

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Table 15.8 RTI RUN NUMBER - 50 STREAM - TAR

STREAM FLOW RATE = 1.4E-02 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	18A	CRESOLS	10000.
2.0	21C	BENZO(A)PYRENE	1000.
3.0	18A	XYLENOLS	1000.
4.0	18A	O-ISOPROPYLPHENOL	1000.
5.0	21B	TRIPHENYLENE	1000.
6.0	21C	PERYLENE	100.
7.0	21C	DIBENZO(A,H)ANTHRACENE	100.
8.0	18A	TRIMETHYLPHENOL	100.
9.0	49A	ARSENIC	10.
10.0	21B	BENZ(A)ANTHRACENE	1.
11.0	68A	CHROMIUM	1.
12.0	21A	ACENAPHTHYLENE	1.
13.0	21A	PHENANTHRENE	1.

Table 15.9 RTI RUN NUMBER - 50 STREAM - ASH

STREAM FLOW RATE = 5.9E-02 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	68A	CHROMIUM	10000.
2.0	49A	ARSENIC	10.
3.0	32A	BERYLLIUM	10.
4.0	71A	MANGANESE	10.
5.0	76A	NICKEL	1.
6.0	83A	MERCURY	1.

Table 15.10 RTI RUN NUMBER - 50 STREAM - GAS

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	42B	CARBON MONOXIDE	2.3E-01
2.5	15A	BENZENE	2.5E-02
2.5	53B	HYDROGEN SULFIDE	2.5E-02
4.0	53C	CARBONYL SULFIDE	6.2E-03
5.0	42B	CARBON DIOXIDE	1.7E-03
6.0	53D	CARBON DISULFIDE	1.6E-03
7.0	13A	METHANETHIOL	1.3E-03
8.0	99A	HYDROGEN	1.3E-03
9.0	25A	THIOPHENE	5.5E-04
10.0	13A	C2H6S	2.9E-04
11.0	01A	METHANE	2.6E-04
12.0	49A	ARSENIC	2.1E-04
13.0	15A	BIPHENYL	1.3E-04
14.0	18A	PHENOL	1.2E-04
15.0	21A	PHENANTHRENE	1.0E-04
16.0	18A	XYLENOLS	9.3E-05
17.0	15A	TOLUENE	8.0E-05
18.0	47B	AMMONIA	8.0E-05
19.0	18A	CRESOLS	5.8E-05

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Table 15.11 RTI RUN NUMBER - 50 STREAM - CONDENSATE

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	18A	CRESOLS	5.7E+00
2.0	18A	XYLENOLS	1.4E+00
3.0	68A	CHROMIUM	5.7E-02
4.0	47B	AMMONIA	4.6E-02
5.0	49A	ARSENIC	1.7E-02
6.0	18A	PHENOL	2.0E-03
7.0	54A	SELENIUM	6.9E-04
8.0	57A	CHLORIDES	8.2E-05
9.0	46A	LEAD	3.4E-05

Table 15.12 RTI RUN NUMBER - 50 STREAM - TAR

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	18A	CRESOLS	2.8E-02
2.0	21C	BENZO(A)PYRENE	6.7E-03
3.0	18A	XYLENOLS	2.2E-03
4.0	18A	O-ISOPROPYLPHENOL	1.8E-03
5.0	21B	TRIPHENYLENE	1.3E-03
6.0	21C	PERYLENE	6.7E-04
7.0	21C	DIBENZO(A,H)ANTHRACENE	5.8E-04
8.0	18A	TRIMETHYLPHENOL	2.0E-04
9.0	49A	ARSENIC	1.3E-05
10.0	21B	BENZ(A)ANTHRACENE	9.1E-06
11.0	68A	CHROMIUM	6.3E-06
12.0	21A	ACENAPHTHYLENE	2.3E-06
13.0	21A	PHENANTHRENE	2.2E-06

Table 15.13 RTI RUN NUMBER - 50 STREAM - ASH

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	68A	CHROMIUM	1.3E-01
2.0	49A	ARSENIC	2.6E-04
3.0	32A	BERYLLIUM	1.4E-04
4.0	71A	MANGANESE	7.4E-05
5.0	76A	NICKEL	2.3E-05
6.0	83A	MERCURY	8.8E-06

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TABLE16.1 SUMMARY DISCHARGE SEVERITY MEASURES FOR SYNTHETIC FUEL PROCESSES

Process: RTI #51 Product Flow Rate: 7.27E-5 Nm^3/s (9.24 SCF/hr)

Coal Type: ND Beulah/Zap Lignite Product Heating Value: 5.96E6 J/Nm^3 (160 Btu/SCF)

Coal Rate (CR): 4.52E-2 g/s (1.79E-4 T/hr) Energy Production Rate (ER): 4330 J/s (1480 Btu/hr)

Stream	Stream Flow Rate	$\sum$DS	$\sum$WDS	$\sum$WDS/CR	$\sum$WDS/ER	No. Compounds Identified	No. Compounds with DS≥1
Gas	3.6E-2 g/s	9.0E3	3.3E2 g/s	7.3E3 g/g	7.6E1 g/J	35	22
Condensate	2.2E-2 g/s	3.3E3	7.2E3 g/s	1.6E5 g/g	1.7E1 g/J	6	4
Tar	5.4 E-4 g/s	1.1E5	5.9E1 g/s	1.3E3 g/g	1.4E-1 g/J	45	15
Ash	1.8E-3 g/s	1.6E4	2.8E1 g/s	6.2E2 g/g	6.5E-2 g/J	14	7

TABLE 16.2 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #51

Coal Type: ND Beulah/Zap Lignite

Stream Description: Gas (Product)

Stream Flow Rate: 7.27E-5 Nm^3/s, ____ ℓ/s, 3.6E-2 g/s

Coal Feed Rate (CR): 4.52E-2 g/s (1.793E-4 tph)

Product Flow Rate: 7.27E-5 Nm^3/s (9.24 SCFH)

Product Heating Value: 5.96E6 J/Nm^3 (160 Btu/SCF)

Energy Production Rate (ER): 4.33E2 J/s (1.48E3 Btu/hr)

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Table 16.2 Continued RTI RUN NUMBER - 51 STREAM - GAS

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
01A	METHANE	2.8E+07	8.5E+00	3.1E-01	4.5E+04	4.7E+00	10.0
13A	METHANETHIOL	2.3E+04	2.3E+01	8.4E-01	3.7E+01	3.9E-03	7.0
13A	C2H6S	1.1E+04	1.1E+01	4.0E-01	1.8E+01	1.8E-03	9.0
15A	BENZENE	2.3E+06	7.7E+02	2.8E+01	3.7E+03	3.9E-01	2.0
15A	TOLUENE	1.3E+06	3.4E+00	1.2E-01	2.1E+03	2.2E-01	14.0
15A	ETHYLBENZENE	5.8E+04	1.3E-01	4.8E-03	9.3E+01	9.7E-03	23.0
15A	XYLENES	4.7E+05	1.1E+00	3.9E-02	7.6E+02	7.9E-02	22.0
15A	BIPHENYL	1.3E+03	1.3E+00	4.7E-02	2.1E+00	2.2E-04	20.5
15B	INDAN	6.0E+03	2.6E-02	9.5E-04	9.7E+00	1.0E-03	26.0
15B	INDENE	6.4E+04	1.4E+00	5.2E-02	1.0E+02	1.1E-02	18.0
18A	PHENOL	7.1E+04	3.7E+00	1.4E-01	1.1E+02	1.2E-02	13.0
18A	CRESOLS	5.4E+04	2.5E+00	9.0E-02	8.7E+01	9.1E-03	15.0
18A	XYLENOLS	1.1E+05	8.5E+00	3.1E-01	1.8E+02	1.8E-02	11.0
21A	NAPHTHALENE	8.7E+04	1.7E+00	6.3E-02	1.4E+02	1.5E-02	17.0
21A	ANTHRACENE	9.5E+02	1.7E-02	6.2E-04	1.5E+00	1.6E-04	28.0
21A	PHENANTHRENE	2.2E+03	1.4E+00	5.0E-02	3.5E+00	3.7E-04	19.0
24A	BENZOFURAN	2.4E+04	4.5E-03	1.7E-04	3.9E+01	4.0E-03	31.0
24B	DIBENZOFURAN	1.0E+03	1.9E-04	6.9E-06	1.6E+00	1.7E-04	34.0
25A	THIOPHENE	2.3E+06	5.1E+02	1.9E+01	3.7E+03	3.9E-01	3.0
42B	CARBON MONOXIDE	3.0E+08	7.5E+03	2.7E+02	4.8E+05	5.0E+01	1.0
42B	CARBON DIOXIDE	1.5E+08	1.7E+01	6.1E-01	2.4E+05	2.5E+01	8.0
47B	AMMONIA	3.3E+04	1.8E+00	6.7E-02	5.3E+01	5.5E-03	16.0
50A	ANTIMONY	5.0E+00	1.0E-02	3.6E-04	8.0E-03	8.4E-07	29.0
53B	HYDROGEN SULFIDE	1.6E+06	1.1E+02	3.9E+00	2.6E+03	2.7E-01	4.0
53C	CARBONYL SULFIDE	1.2E+05	3.2E+01	1.2E+00	1.9E+02	2.0E-02	6.0
53D	CARBON DISULFIDE	3.9E+03	1.3E+00	4.7E-02	6.3E+00	6.5E-04	20.5
54A	SELENIUM	5.0E+00	2.5E-02	9.1E-04	8.0E-03	8.4E-07	27.0
58A	BROMINE	9.6E+00	(1.4E-03)	(5.0E-05)	(1.5E-02)	(1.6E-06)	33.0
60A	SCANDIUM	1.3E-02	2.5E-07	8.9E-09	2.1E-05	2.2E-09	35.0
62A	TITANIUM	3.8E+01	6.3E-03	2.3E-04	6.1E-02	6.4E-06	30.0
68A	CHROMIUM	7.1E+00	7.1E+00	2.6E-01	1.1E-02	1.2E-06	12.0
71A	MANGANESE	1.9E+02	3.8E-02	1.4E-03	3.1E-01	3.2E-05	25.0

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Table 16.2 Continued

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DB RANK
74A	COBALT	2.1E-01	4.2E-03	1.5E-04	3.4E-04	3.5E-08	32.0
83A	MERCURY	2.5E+00	4.9E-02	1.8E-03	4.0E-03	4.2E-07	24.0
99A	HYDROGEN	1.5E+07	(3.7E+01)	(1.3E+00)	(2.4E+04)	(2.5E+00)	5.0
SUM OF DS INCLUDING ALL COMPOUNDS = 9.0E+03			SUM OF	WDS/CR	INCLUDING ALL COMPOUNDS = 7.3E+03		
SUM OF DS EXCLUDING SOME COMPOUNDS= 9.0E+03			SUM OF	WDS/CR	EXCLUDING SOME COMPOUNDS= 7.3E+03		
SUM OF WDS INCLUDING ALL COMPOUNDS =3.3E+02			SUM OF	WDS/ER	INCLUDING ALL COMPOUNDS = 7.6E-01		
SUM OF WDS EXCLUDING SOME COMPOUNDS=3.3E+02			SUM OF	WDS/ER	EXCLUDING SOME COMPOUNDS= 7.6E-01		

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TABLE 16.3 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #51

Coal Type: ND Beulah/Zap Lignite

Stream Description: Condensate (Discharge)

Stream Flow Rate: _____ m^3/s, 2.20E-5 t/s, 2.20E-2 g/s

Coal Feed Rate (CR): 4.52E-2 g/s (1.79E-4 tph)

Product Flow Rate: 7.27E-5 Nm^3/s (9.24 SCFH)

Product Heating Value: 5.96E6 J/Nm^3 (160 Btu/SCF)

Energy Production Rate (ER): 4.33E2 J/s (1.48E3 Btu/hr)

Table 16.3 Continued

RTI RUN NUMBER - 51 STREAM - CONDENSATE

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	PRODUCTION FACTORS UG/J PRODUCT	DS RANK
18A	PHENOL	2.8E+06	1.6E+02	3.6E+00	1.4E+03	1.4E-01	4.0
18A	CRESOLS	1.4E+06	2.8E+05	6.2E+03	6.8E+02	7.1E-02	1.0
18A	XYLENOLS	2.3E+05	4.6E+04	1.0E+03	1.1E+02	1.2E-02	2.0
47A	CYANIDE	2.3E+02	2.3E-01	5.1E-03	1.1E-01	1.2E-05	6.0
47B	AMMONIA	3.2E+06	1.3E+03	2.8E+01	1.6E+03	1.6E-01	3.0
57A	CHLORIDES	8.6E+05	6.6E-01	1.5E-02	4.2E+02	4.4E-02	5.0

SUM OF DS INCLUDING ALL COMPOUNDS = 3.3E+05 SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 1.6E+05

SUM OF WDS INCLUDING ALL COMPOUNDS =7.2E+03 SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 1.7E+01

TABLE 16.4 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #51

Coal Type: ND Beulah/Zap Lignite

Stream Description: Tar (Byproduct)

Stream Flow Rate: _____ m^3/s, 5.37E-7 ℓ/s, 5.4E-4 g/s

Coal Feed Rate (CR): 4.52E-2 g/s (1.79E-4 tph)

Product Flow Rate: 7.27E-5 Nm^3/s (9.24 SCFH)

Product Heating Value: 5.96 J/Nm^3 (160 Btu/SCF)

Energy Production Rate (ER): 43.3E1 J/s (1.48E3 Btu/hr)

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Table 16.4 Continued

RTI RUN NUMBER - 51 STREAM - TAR

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	PRODUCTION FACTORS UG/J PRODUCT	DS RANK
10C	BENZIDINE	3.0E+02	1.0E-01	5.4E-05	3.6E+00	3.7E-04	23.0
15A	BIPHENYL	2.3E+03	7.7E-01	4.1E-04	2.7E+01	2.8E-03	17.0
18A	PHENOL	2.2E+04	6.5E+00	3.5E-03	2.6E+02	2.7E-02	12.0
18A	CRESOLS	6.7E+04	6.7E+04	3.6E+01	8.0E+02	8.3E-02	1.0
18A	XYLENOLS	9.7E+03	9.7E+03	5.2E+00	1.2E+02	1.2E-02	4.0
18A	TRIMETHYLPHENOL	2.6E+03	2.6E+03	1.4E+00	3.1E+01	3.2E-03	5.0
18A	O-ISOPROPYLPHENOL	1.4E+04	(1.4E+04)	(7.5E+00)	(1.7E+02)	(1.7E-02)	2.0
21A	NAPHTHALENE	1.7E+04	1.1E-01	6.1E-05	2.0E+02	2.1E-02	22.0
21A	C2-(ALKYL)NAPHTHALENE	5.3E+03	7.8E-03	4.2E-06	6.3E+01	6.6E-03	38.0
21A	1-METHYLNAPHTHALENE	7.7E+03	1.1E-02	6.1E-06	9.1E+01	9.5E-03	36.0
21A	2-METHYLNAPHTHALENE	3.1E+03	4.6E-03	2.4E-06	3.7E+01	3.8E-03	41.0
21A	ACENAPHTHYLENE	8.3E+03	(1.7E+00)	(9.3E-04)	(9.9E+01)	(1.0E-02)	14.0
21A	ACENAPHTHENE	2.1E+03	(4.4E-01)	(2.3E-04)	(2.5E+01)	(2.6E-03)	19.0
21A	ANTHRACENE	6.7E+03	4.0E-02	2.1E-05	8.0E+01	8.3E-03	27.0
21A	PHENANTHRENE	1.4E+04	2.9E+00	1.6E-03	1.7E+02	1.7E-02	13.0
21B	BENZ(A)ANTHRACENE	1.6E+03	1.2E+01	6.4E-03	1.9E+01	2.0E-03	10.0
21B	TRIPHENYLENE	1.9E+03	(2.4E+03)	(1.3E+00)	(2.3E+01)	(2.4E-03)	6.0
21B	CHRYSENE	2.4E+03	3.6E-01	2.0E-04	2.8E+01	3.0E-03	20.0
21B	PYRENE	3.6E+03	5.3E-03	2.8E-06	4.3E+01	4.5E-03	40.0
21C	DIBENZO(A,H)ANTHRACENE	4.0E+02	1.4E+03	7.7E-01	4.7E+00	4.9E-04	8.0
21C	BENZO(A)PYRENE	7.0E+02	1.2E+04	6.3E+00	8.3E+00	8.7E-04	3.0
21C	BENZO(E)PYRENE	4.0E+02	4.3E-02	2.3E-05	4.7E+00	4.9E-04	26.0
21C	PERYLENE	1.0E+02	(1.7E+03)	(8.9E-01)	(1.2E+00)	(1.2E-04)	7.0
22A	FLUORENE	7.1E+03	(5.2E-02)	(2.8E-05)	(8.4E+01)	(8.8E-03)	24.0
22B	FLUORANTHENE	7.0E+03	2.5E-02	1.3E-05	8.3E+01	8.7E-03	31.0
21D	BENZO(G,H,I)PERYLENE	1.0E+02	(7.7E-01)	(4.1E-04)	(1.2E+00)	(1.2E-04)	16.0
22B	BENZO(A)FLUORENE	2.3E+03	(1.5E-02)	(8.0E-06)	(2.7E+01)	(2.8E-03)	34.0
22B	BENZO(B)FLUORENE	1.7E+03	(1.1E-02)	(5.9E-06)	(2.0E+01)	(2.1E-03)	37.0
22C	BENZO(K)FLUORANTHENE	8.0E+02	1.7E-02	8.9E-06	9.5E+00	9.9E-04	33.0
22C	BENZO(B)FLUORANTHENE	1.0E+02	3.8E-02	2.1E-05	1.2E+00	1.2E-04	29.0
22D	INDENO(1,2,3-CD)PYRENE	1.0E+02	2.1E-02	1.1E-05	1.2E+00	1.2E-04	32.0
23B	QUINOLINE	2.1E+03	4.4E-02	2.3E-05	2.5E+01	2.6E-03	25.0
23B	ACRIDINE	2.0E+02	7.1E-04	3.8E-07	2.4E+00	2.5E-04	44.0
23C	CARBAZOLE	2.7E+03	3.9E-02	2.1E-05	3.2E+01	3.3E-03	28.0
24B	DIBENZOFURAN	6.4E+03	6.2E-03	3.3E-06	7.6E+01	7.9E-03	39.0
25B	BENZOTHIOPHENE	2.2E+03	3.1E-02	1.7E-05	2.6E+01	2.7E-03	30.0
49A	ARSENIC	4.5E+00	1.1E+01	6.0E-03	5.3E-02	5.6E-06	11.0

Table 16.4 Continued

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
50A	ANTIMONY	1.1E-01	7.5E-04	4.0E-07	1.3E-03	1.4E-07	43.0
54A	SELENIUM	2.7E+00	6.1E-01	3.3E-04	3.2E-02	3.3E-06	18.0
58A	BROMINE	6.8E-01	2.6E-06	1.4E-09	8.1E-03	8.4E-07	45.0
68A	CHROMIUM	2.1E+00	1.3E+01	7.0E-03	2.5E-02	2.6E-06	9.0
71A	MANGANESE	6.8E-01	1.4E-02	7.3E-06	8.1E-03	8.4E-07	35.0
76A	NICKEL	1.7E+01	3.4E-01	1.8E-04	2.0E-01	2.1E-05	21.0
81A	ZINC	1.7E+01	1.0E-03	5.4E-07	2.0E-01	2.1E-05	42.0
82A	CADMIUM	1.4E+00	1.4E+00	7.5E-04	1.7E-02	1.7E-06	15.0

SUM OF DS INCLUDING ALL COMPOUNDS = 1.1E+05
SUM OF DS EXCLUDING SOME COMPOUNDS= 9.2E+04

SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 1.3E+03
SUM OF WDS/CR EXCLUDING SOME COMPOUNDS= 1.1E+03

SUM OF WDS INCLUDING ALL COMPOUNDS =5.9E+01
SUM OF WDS EXCLUDING SOME COMPOUNDS=5.0E+01

SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 1.4E-01
SUM OF WDS/ER EXCLUDING SOME COMPOUNDS= 1.1E-01

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TABLE 16.5 ENVIRONMENTAL ANALYSIS RESULTS FOR COAL CONVERSION PROCESS STREAMS

Process: RTI #51

Coal Type: ND Beulah/Zap Lignite

Stream Description: Ash (Discharge)

Stream Flow Rate: _____ m^3/s, _____ ℓ/s, 1.8E-3 g/s

Coal Feed Rate (CR): 4.52E-2 g/s (1.79E-4 tph)

Product Flow Rate: 7.27E-5 Nm^3/s (9.24 SCFH)

Product Heating Value: 5.96E6 J/Nm^3 (160 Btu/SCF)

Energy Production Rate (ER): 4.33E2 J/s (1.48E3 Btu/hr)

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Table 16.5 Continued

RTI RUN NUMBER - 51 STREAM - ASH

		CONC	DS	WDS (G/S)	PRODUCTION FACTORS UG/G COAL	UG/J PRODUCT	DS RANK
32A	BERYLLIUM	1.6E+01	9.4E+00	1.7E-02	6.4E-01	6.6E-05	3.0
46A	LEAD	3.6E+00	7.2E-02	1.3E-04	1.4E-01	1.5E-05	9.0
49A	ARSENIC	2.2E+01	5.5E+01	9.9E-02	8.7E-01	9.1E-05	2.0
50A	ANTIMONY	1.8E+00	1.2E-02	2.2E-05	7.1E-02	7.4E-06	12.0
54A	SELENIUM	5.0E+00	2.9E+00	5.3E-03	2.0E-01	2.1E-05	7.0
58A	BROMINE	1.4E+00	(5.4E-06)	(9.7E-09)	(5.6E-02)	(5.8E-06)	13.0
57A	CHLORIDE	4.1E-01	1.6E-06	2.8E-09	1.6E-02	1.7E-06	14.0
68A	CHROMIUM	2.5E+03	1.6E+04	2.8E+01	9.9E+01	1.0E-02	1.0
71A	MANGANESE	2.6E+02	5.2E+00	9.3E-03	1.0E+01	1.1E-03	5.0
76A	NICKEL	3.7E+02	7.4E+00	1.3E-02	1.5E+01	1.5E-03	4.0
78A	COPPER	1.6E+02	1.6E-01	2.9E-04	6.4E+00	6.6E-04	8.0
81A	ZINC	6.8E+01	1.4E-02	2.4E-05	2.7E+00	2.8E-04	11.0
82A	CADMIUM	2.0E-01	2.0E-02	3.6E-05	7.9E-03	8.3E-07	10.0
83A	MERCURY	1.0E+00	5.0E+00	9.0E-03	4.0E-02	4.1E-06	6.0

SUM OF DS INCLUDING ALL COMPOUNDS = 1.6E+04
SUM OF DS EXCLUDING SOME COMPOUNDS= 1.6E+04

SUM OF WDS/CR INCLUDING ALL COMPOUNDS = 6.2E+02
SUM OF WDS/CR EXCLUDING SOME COMPOUNDS= 6.2E+02

SUM OF WDS INCLUDING ALL COMPOUNDS =2.8E+01
SUM OF WDS EXCLUDING SOME COMPOUNDS=2.8E+01

SUM OF WDS/ER INCLUDING ALL COMPOUNDS = 6.5E-02
SUM OF WDS/ER EXCLUDING SOME COMPOUNDS= 6.5E-02

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Table 16.6 RTI RUN NUMBER - 51 STREAM - GAS

STREAM FLOW RATE = 3.6E-02 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	42B	CARBON MONOXIDE	10000.
2.0	15A	BENZENE	1000.
3.0	25A	THIOPHENE	1000.
4.0	53B	HYDROGEN SULFIDE	100.
5.0	99A	HYDROGEN	10.
6.0	53C	CARBONYL SULFIDE	10.
7.0	13A	METHANETHIOL	10.
8.0	42B	CARBON DIOXIDE	10.
9.0	13A	C2H6S	10.
10.0	01A	METHANE	10.
11.0	18A	XYLENOLS	10.
12.0	68A	CHROMIUM	10.
13.0	18A	PHENOL	1.
14.0	15A	TOLUENE	1.
15.0	18A	CRESOLS	1.
16.0	47B	AMMONIA	1.
17.0	21A	NAPHTHALENE	1.
18.0	15B	INDENE	1.
19.0	21A	PHENANTHRENE	1.
20.5	15A	BIPHENYL	1.
20.5	53D	CARBON DISULFIDE	1.
22.0	15A	XYLENES	1.

Table 16.7 RTI RUN NUMBER - 51 STREAM - CONDENSATE

STREAM FLOW RATE = 2.2E-02 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	18A	CRESOLS	100000.
2.0	18A	XYLENOLS	10000.
3.0	47B	AMMONIA	1000.
4.0	18A	PHENOL	100.

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Table 16.8

RTI RUN NUMBER - 51 STREAM - TAR

STREAM FLOW RATE = 5.4E-04 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	18A	CRESOLS	100000.
2.0	18A	O-ISOPROPYLPHENOL	10000.
3.0	21C	BENZO(A)PYRENE	10000.
4.0	18A	XYLENOLS	10000.
5.0	18A	TRIMETHYLPHENOL	1000.
6.0	21B	TRIPHENYLENE	1000.
7.0	21C	PERYLENE	1000.
8.0	21C	DIBENZO(A,H)ANTHRACENE	1000.
9.0	68A	CHROMIUM	10.
10.0	21B	BENZ(A)ANTHRACENE	10.
11.0	49A	ARSENIC	10.
12.0	18A	PHENOL	10.
13.0	21A	PHENANTHRENE	1.
14.0	21A	ACENAPHTHYLENE	1.
15.0	82A	CADMIUM	1.

Table 16.9

RTI RUN NUMBER - 51 STREAM - ASH

9-1/8" STREAM FLOW RATE = 1.8E-03 GM/SEC

RANK	MEG#	COMPOUND	DS ORDER OF MAGNITUDE
1.0	68A	CHROMIUM	10000.
2.0	49A	ARSENIC	100.
3.0	32A	BERYLLIUM	10.
4.0	76A	NICKEL	10.
5.0	71A	MANGANESE	10.
6.0	83A	MERCURY	10.
7.0	54A	SELENIUM	1.

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Table 16.10 RTI RUN NUMBER - 51 STREAM - GAS

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	42B	CARBON MONOXIDE	3.3E-01
2.0	15A	BENZENE	3.4E-02
3.0	25A	THIOPHENE	2.3E-02
4.0	53B	HYDROGEN SULFIDE	4.7E-03
5.0	99A	HYDROGEN	1.6E-03
6.0	53C	CARBONYL SULFIDE	1.4E-03
7.0	13A	METHANETHIOL	1.0E-03
8.0	42B	CARBON DIOXIDE	7.3E-04
9.0	13A	C2H6S	4.8E-04
10.0	01A	METHANE	3.7E-04
11.0	18A	XYLENOLS	3.7E-04
12.0	68A	CHROMIUM	3.1E-04
13.0	18A	PHENOL	1.6E-04
14.0	15A	TOLUENE	1.5E-04
15.0	18A	CRESOLS	1.1E-04
16.0	47B	AMMONIA	8.1E-05
17.0	21A	NAPHTHALENE	7.7E-05
18.0	15B	INDENE	6.3E-05
19.0	21A	PHENANTHRENE	6.1E-05
20.5	15A	BIPHENYL	5.7E-05
20.5	53D	CARBON DISULFIDE	5.7E-05
22.0	15A	XYLENES	4.7E-05

9-1/8"

Table 16.11 RTI RUN NUMBER - 51 STREAM - CONDENSATE

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	18A	CRESOLS	7.4E+00
2.0	18A	XYLENOLS	1.2E+00
3.0	47B	AMMONIA	3.4E-02
4.0	18A	PHENOL	4.4E-03

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Table 16.12 RTI RUN NUMBER - 51 STREAM - TAR

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	18A	CRESOLS	4.3E-02
2.0	18A	O-ISOPROPYLPHENOL	9.1E-03
3.0	21C	BENZO(A)PYRENE	7.6E-03
4.0	18A	XYLENOLS	6.3E-03
5.0	18A	TRIMETHYLPHENOL	1.7E-03
6.0	21B	TRIPHENYLENE	1.6E-03
7.0	21C	PERYLENE	1.1E-03
8.0	21C	DIBENZO(A,H)ANTHRACENE	9.3E-04
9.0	68A	CHROMIUM	8.5E-06
10.0	21B	BENZ(A)ANTHRACENE	7.7E-06
11.0	49A	ARSENIC	7.3E-06
12.0	18A	PHENOL	4.2E-06
13.0	21A	PHENANTHRENE	1.9E-06
14.0	21A	ACENAPHTHYLENE	1.1E-06
15.0	82A	CADMIUM	9.1E-07

Table 16.13 RTI RUN NUMBER - 51 STREAM - ASH

9-1/8"

RANK	MEG#	COMPOUND	WDS/J/SEC (G/J)
1.0	68A	CHROMIUM	3.4E-02
2.0	49A	ARSENIC	1.2E-04
3.0	32A	BERYLLIUM	2.0E-05
4.0	76A	NICKEL	1.6E-05
5.0	71A	MANGANESE	1.1E-05
6.0	83A	MERCURY	1.1E-05
7.0	54A	SELENIUM	6.4E-06

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